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Limited Dealings in Bonds

The plan of the investment bankers to resume limited dealings in bonds will tend to help banking conditions rather than the investment market. So far as securities can be sold at prices approximating those of July 30 the transactions will mean an invaluable moral support for the collateral security of loans. The announcement of the committee representing the investment dealers shows that the desire is to apply the proceeds of sales to the reduction of loans; if prices are not far from those which prevailed when trading ended in July, any fair volume of transactions will mean a corresponding decrease in the liabilities of dealers to banks and, in the same degree, an increase in the strength of the banking position. The cautious steps in the direction of limited trading which the dealers are thus taking represent a reasonable, determined effort to go ahead and do business. They cannot be interpreted fairly as a sign of anything but a brightening of the outlook. As the days pass funds awaiting investment are piling up. Some of these funds, belonging to shrewd buyers, will be put into securities that can be bought at sacrifice prices. Others will be held until the return of confidence, presaging the end of the war. But a certain part of the money will be invested gradually, and later, if not immediately, in securities at prices and rates of yield that will not differ seriously from those prevailing before the war. Available investment funds are likely to increase rather than decrease, and the careful testing of the market by the bond dealers hastens the day when new financing can be undertaken.

South American Trade Problems

As compared with former conditions, there is now less effervescent enthusiasm over the outlook for immediate trade in Latin America but a more earnest appreciation of neglected possibilities. This is as it should be. It means that manufacturers here realize more keenly than ever before that they have carelessly allowed their long indifference toward overseas markets to blind them to the great advantage of permanent commercial and neighborly relations with the people of South America. They know now that if they expect to have these relations in the future they must give time, effort and money to the cultivation of them. When the fearful European upheaval was started the general expectation here was that commercial activities of the belligerent nations would necessarily end. With the demand for men for army service and conditions of war upon the high seas, it did not appear to be possible that any foreign markets could be supplied from Europe. As later developments showed, this was too hasty a conclusion. The main consideration in South American trade at present, however, is not that some of the European nations are continuing industrial activity but that the financial consequences of the war, even in remote South America, are so appalling. Both industrially and for governmental requirements South American countries have been financed so largely in Europe that the interruption of their usual supplies of capital is a serious detriment to current business and future advancement. The problem before manufacturers of this country is not the mere easy sale of goods. It is not the capture of a market left to roam at large without friendly protection. It is the consideration of methods that shall promote neighborly relations with the people of Latin America—social, banking, shipping and commercial. It is such methods that are now receiving serious attention from many in this country of large outlook and interests. Traditional custom and desire make plain commercial rivalry and friendliness our means of conquest in South America.

Rate-Making for Gas Utilities

The paper on gas rates read by Mr. Henry L. Coleman before the Empire State Gas and Electric Association and reported elsewhere in this issue shows that the commercial possibilities of better rate-making in that industry are being realized. The subject of rate-making has, in fact, been taken up by the American Gas Institute, a committee of which is to render a report on Oct. 22. For many years there has been little change from the old-time practice of selling gas at a fixed price per unit of volume used, but in some localities different rates have been made for different kinds of service with resultant advantage to the producer and without loss to the user. As a whole, the gas industry has been backward in its application of scientific rate-making systems. Crude as some of the rate-making schemes of other utilities have been, they have been more defensible commercially and scientifically than the fixed flat rate, and they have resulted in increases in output and in both gross and net earnings. Whatever criticism may be made of electrical rate-making, it cannot be said fairly that it has prevented the growth of a great industry. It has really greatly accelerated the growth of the industry. Fortunately electrical service is of a kind which in most applications has no competitor that can furnish the required energy as simply, economically or reliably. In other respects it must meet competition, and where it does that fact must necessarily be taken into consideration in rate-

making. Rate-making is a failure unless it results in business advantageous alike to the utility and its customers, and in all attempts to develop a more scientific basis for this vital feature of management this material consideration must be kept in mind.

The Nature of Reflection

Dr. P. G. Nutting's paper before the Illuminating Engineering Society on specular and diffuse reflection is an excellent summary of the situation to date. The whole story is that when light falls on any substance part of it is reflected, following the ordinary law of mirrors, and part of it is diffused, no substance being sufficiently smooth to scatter no light or sufficiently matte to scatter it all. From a practical standpoint the reflecting properties of paper such as is used for printing give the most important example of mixed reflection. The subject has been considerably discussed, and sufficient data have been accumulated by the author of this paper and others to be of practical service. As Dr. Nutting points out, there is no difficulty in getting a measurement of the ratio between the specular and diffuse reflection by a number of different methods. The main point to consider in choice of the method is that when a pencil of light falls obliquely on a surface, giving mixed reflection, part of it is specularly reflected in a given direction, the rest is diffusely reflected in all directions from the point of incidence. To obtain in absolute measure the ratio in question it is necessary, first, to measure the specular component and, second, to integrate the diffused component over the hemisphere through which it is distributed. The distribution in this hemisphere is approximately determinable from the ordinary theory, but the residual errors, particularly with some surfaces, are likely to be large.

It is not even probable that the locus of the diffuse reflection, if plotted to scale, would be a surface of revolution. While exact figures are therefore difficult to obtain, it is extremely easy, as Dr. Nutting himself and others have shown, to obtain approximately relative values of the two elements of reflection either by direct photometry or by the polarization methods which depend on the fact that at a suitable angle the specularly reflected light is nearly or quite polarized, as can readily be seen by looking at a printed page in the sunlight through a Nicol prism. The detailed study of the light diffusely or specularly reflected in different directions from a piece of paper was first suggested, so far as we know, by E. C. Pickering nearly forty years ago, but oddly enough it is only after the lapse of this long period that the advance in the theory and practice of artificial illumination has brought the subject again to the front. Now, for practical purposes it does not very much matter what particular method is taken for the measurement or whether that method gives the absolute ratio between the light reflected in one way or the other. What is of importance is that a criterion following some definite method of measurement should be determined separating good surfaces from bad as considered from the standpoint of vision. Whatever criterion may be selected, we are very favorably impressed by Dr. Nutting's suggestion of "glossiness" as the defining name. It strikes us as being much preferable to "glare," which refers to a physiological rather than a physical matter. The main point to be considered is to determine that amount of glossiness which can be conveniently tolerated in papers used for printing, and to apply the criterion rigorously.

Some Aspects of Industrial Chemistry

The address by Dr. L. H. Baekeland, at Columbia University, to inaugurate the Charles F. Chandler lectureship contains much interesting history and offers many excellent suggestions. The importance of industrial chemistry in modern life is enormous. Human beings are, in a certain sense, chemical engines, and their supply of food is, from the same point of view, an operation in industrial chemistry. As Dr. Baekeland points out, all agriculture is but a branch of industrial chemistry. Man differs from other animals in being able to carry on, with scientific skill, those photochemical processes which result in the production of proteids and hydro-carbonaceous food, whereby a very large surface density of life can be maintained in the cities of our planet.

One of the greatest problems confronting agriculture is the supply of a sufficient quantity of nitrogen to the plants forming the world's crop. Although our atmosphere is about 80 per cent nitrogen, and each square centimeter of the earth's surface therefore supports nearly a kilogram of nitrogen gas, yet plants living in this atmosphere may starve for want of nitrogen in their composition. It is only in recent years that industrial processes have been developed for capturing nitrogen from the air into chemical unions producing solids or liquids available as fertilizers for feeding plants. Already three processes have become available, one causing nitrogen to unite with oxygen in the electric furnace, and another causing atmospheric nitrogen to combine with calcium carbide. The third effects the synthesis of ammonia by the combination of hydrogen and nitrogen.

The address contains an appeal for closer co-operation between financial and engineering interests in this country. Capital is at a disadvantage when it seeks to support a new industrial process, because exaggerated statements are so apt to be made concerning the possibilities of a new undertaking, and because it is difficult to discover the particular new project which has the greatest hope of success. On the other hand, new engineering projects of value often fail merely for the want of reasonable and prudent financial support. Organized methods of effecting closer co-operation between these two forces are slowly making themselves indispensable, from the success attending existing prudent combinations. The value of patent monopoly to enterprise and civilization is pointed out in this connection, since no individual, group or corporation can reason-

ably embark upon a new process necessarily involving large initial development expenditures unless protected through patents by the expectation of a subsequent temporary monopoly of the process in question.

Station Reconstruction

Rebuilding an electric station without interruption of service is always a feat involving much ingenuity and sometimes a very high degree of engineering skill. The reconstruction of the Fort Wayne power house outlined on another page shows no exception to this rule. The station reorganized had been built only seven years and when constructed gave promise of exceptionally good results. It was of the double-decked type with the turbines on the second floor directly over the boilers, an arrangement which in principle is a good one, leading to short steam connections and an economical design of station; in fact, stations of this character have proved very satisfactory. In this instance, however, whether from the character of the stresses derived from horizontal turbines or from other causes unknown, an amount of vibration developed which made reconstruction and abandonment of the double-deck scheme imperative. All attempts to balance the turbine so as to suppress vibration seem to have failed, and when the conditions of load demanded an increase in equipment advantage was taken of the opportunity to make a complete change in the arrangement of the units and thereby remedy the existing trouble.

The plant contained both twenty-five-cycle and sixty-cycle generators, and the increasing load demanded an increase of sixty-cycle equipment which was met by the installation of a pair of 6250-kva turbo-generators. To accommodate these a building was erected alongside the original station with its turbine floor on the level of the old boiler floor, and a basement was provided for the auxiliaries. The result was a new and efficient plant for the sixty-cycle service, the new turbines being more efficient than the older ones. The main twenty-five-cycle machines had to be moved without interrupting the service on the railway lines to which they fed energy. At least one of these had to be in operation all but continuously except during periods of the very lightest load. The railway turbines were dismantled one at a time, and the pieces were carefully lowered by the traveling crane through a hole in the turbine-room floor, loaded on a flat car and shunted around to the new portion of the station. The ground-floor equipment of auxiliaries was then transferred to the new turbine room, and the whole equipment was put to work without interruption of service, leaving all of the active generating equipment alongside the boiler room in the new building. The old turbine floor was then put to good use by placing in it substantially all the control and switching apparatus for the station, and also installing there three large motor-generator sets, two used for the direct feeding of the railway lines and the third as a frequency changer to enable the night load to be carried from the sixty-cycle generators.

One specially interesting feature of the new portion of the plant is a corridor in the basement for the entrance of cooling air for the generators. After passing through the generators the warm air is turned into the boiler room through suitable ducts. Two of the large condensers and some of the auxiliary appliances as well are installed in this air corridor, and the large entrances into it under the turbo-generators serve to limit to the basement a considerable amount of the noise from the machines which otherwise would be unpleasantly perceptible in the turbine room itself. There is little doubt that lessening the noise conduces to efficiency in the operating staff, for while the attendants become accustomed to the din after a while it is very likely to affect their usefulness to a material extent. Quiet operation of the generating plant is certainly to be desired, and when, as in this case, other useful results can be brought about by the suppression of the noise the result accomplished becomes doubly desirable.

Colored Screens and Light Filters in Photometry

In modern photometry difference in the color of the lamps under comparison causes much trouble. Any appreciable color difference reduces considerably the precision of the photometric comparison. It is possible to use a flicker photometer in such cases, but many photometrists are inclined to mistrust the flicker photometer and prefer the ordinary steady-illumination photometer, even with all the uncertainties that beset color differences.

If, however, a colored screen can be inserted on one side or the other of the photometer, so as to bring about an approximate color match, then there ceases to be any unusual difficulty in the photometric comparison; but a question immediately arises as to what is the numerical absorption coefficient of the color screen. The color difficulty has thus been shifted, but not eradicated. However, the hope is always before us of arriving at standardized color screens which may be regularly obtainable, durable and easily checked.

Two papers were presented at the Cleveland convention of the Illuminating Engineering Society on this quest of the standard color screen—one, by Messrs. Herbert E. Ives and Edwin F. Kingsbury, on experiments with liquid screens, and the other, by Dr. C. E. Kenneth Mees, on solid screens. The results reported by Dr. Mees on his series of experiments with liquid screens show how difficult it is to produce a standard glass filter cell. Great care had to be given to the mechanical, optical and chemical constituents before cells were produced which gave consistent results. In fact, it would seem that the technique involved is more suited to the standardizing laboratory than to the ordinary photometry room. It is evident that if a satisfactory set of solid-glass screens could be made reproducible within proper limits they would be greatly preferable to liquid screens, although the latter might be resorted to for the standardization of the glass filters.

The News of the Week

**Activities and Events in the Electrical Field—
Reports of Meetings—Commission Findings, Etc.**

New England Section, N. E. L. A., Gives Lecture Service

In accordance with plans advanced at the recent Narragansett Pier convention of the New England Section of the National Electric Light Association a special lecture service has been inaugurated for this fall and winter to present publicly the advantages of using electrical labor-saving appliances in the home. The plan is for central-station companies to make arrangements with women's clubs, etc., for the presentation of these lectures. If any company desires a demonstrator or wishes to have the lectures illustrated, it will receive the co-operation of the section secretary, Miss O. A. Bursiel, who has headquarters at 149 Tremont Street, Boston.

Washington Dims Residence Street Lamps

Extremely bright lamps will not be allowed on the residence streets of Washington after Oct. 21. A regulation to this effect has been adopted by the commissioners of the District of Columbia, on the recommendation of the Washington City Electrical Engineer.

The regulation prohibits the use of lamps or clusters of lamps exceeding 100 cp on streets other than business streets and so designated by the commissioners. Lamps of unusually bright quality have recently been placed before isolated stores on residence streets, with the result that numerous complaints have been made by householders.

Another new rule in Washington is a regulation requiring a minimum height of 15 ft. for all private lamps or clusters of lamps suspended over sidewalks or other public space. This rule also requires that all such lamps shall be inclosed in opalescent glass in order that eyes of passers-by shall be protected from glare.

Many motion-picture theaters and private hotels, as well as stores, in Washington are affected by the new regulations.

Toronto Hydro-Electric Needs More Funds

Subject to the consent of the City Council and the Ontario Railway Board, the Toronto Hydro-Electric Commission purposes to increase its capital stock by another $2,000,000. It is stated the money is required to increase the size of the system and for extensions of the lighting of the streets and parks of Toronto. Included with the amount, however, are a sum of $443,100.56, the difference between the face value of the debentures already issued and the amount realized by their sale, and a further sum of $220,428.45 as an allowance to cover the cost and contingencies of the sale of the proposed new issue. The balance of the issue will be expended as follows: Extensions of street and park lighting, $24,627.93; increasing the supply of energy for the operation of the civic car lines, $34,713.49, and additions to the system, $1,260,985.66.

The previous issue of debentures amounting to $5,650,000, authorized under bylaws, have been sold and the proceeds used on construction and bringing the system to its present standard. It is estimated that the proposed new issue will be self-sustaining, producing a revenue of $469,927, of which $9,927 will be paid by the taxpayers, for extra street and park lighting. After all charges have been met a surplus of $9,398.46 is anticipated.

Service Standards of the Illinois Commission

In the rules establishing standards for gas and electric service for the State of Illinois which, by order of the commission, are to become effective Nov. 1, sixty days may elapse between the setting of a customer's meter and checking the same meter for correct connection, proper mechanical conditions, suitability of location, and accuracy of measurement within 4 per cent. Concerning voltage variation on lighting circuits, the rules specify that fluctuation shall not exceed 5 per cent plus or minus for a longer period than one minute at each instance. On motor-service circuits a fluctuation of 10 per cent is allowable. The rules require that free line extension shall be made for a single customer or group of customers, provided that the line extension does not require more than twice as many poles at standard spacing as there are individual applicants.

Senate Adopts Trust Bill Report

The Senate on Oct. 5 adopted the conference report on the Clayton anti-trust bill, which is the equivalent of passing the bill, provided that no alterations are made in the report by the House, and it is definitely understood that none will be. If anyone in the House should attempt to make any alterations, it is stated in Washington that the rules committee will bring in a rule shutting off debate. The bill will be sent forthwith to the White House for signature.

There is but one possibility in the way of this, and that is that Southern Democrats in the House may attempt a filibuster to prevent the passage of any legislation unless the House agrees to pass some measure for the relief of Southern cotton growers.

President Wilson has told callers at the White House during the week that the sharp attacks that have been made on the Clayton bill conference report have but confirmed him in his approval of the work of the conferees. He will sign the bill.

The report was adopted in the Senate by a vote of thirty-five to twenty-four. Senator Reed did his best to have the bill recommitted with instructions to reinstate for violations of certain sections criminal penalties which were in the bill as it was passed by the Senate and were taken out by the conferees. In this he failed. Two other Democratic Senators voted with him against the adoption of the report, Senators Lane and Martine. His first test of strength, which was on a motion to recommit the report, brought him five votes of Democratic Senators, namely, Lane, Martine, Thomas, Vardaman and Williams. Senator Root was the only Republican who voted against the motion. Later he voted against adopting the conference report. Senator Poindexter, the only Progressive Senator in the cham-

ber, voted against the Reed motion to recommit, but for the motion to adopt.

Immediately after the final vote was taken on the bill Senator Reed announced that he intends to introduce a new bill to restore the criminal penalty clauses contained in the original bill.

The present plan in Washington is for Congress to take a recess from about Oct. 15 to about Nov. 15. Congress has been in session eighteen months.

American Patent Law Association

As a meeting of the Washington Patent Law Association held Sept. 28 several amendments to the articles of association were adopted to define more clearly the national character of the organization. For a long time the number of members residing outside the District of Columbia has exceeded the number residing within the District, and the growth of the membership from the country at large has been so rapid that the non-resident members now outnumber the resident members three to one. The association has on its rolls a large proportion of the leading patent lawyers of the United States and a goodly number from other countries.

At the meeting the name was changed to the "American Patent Law Association," and provision was made for the organization of advisory councils in different localities throughout the United States. It is thought that such a plan will be of advantage to the association in carrying on its work in connection with matters pertaining to legislation and administration relating to the patent system. The action was taken after the submission of the proposition to the entire membership and its nearly unanimous indorsement.

The present officers of the association are: Mr. Ernest W. Bradford, president; Mr. Frank L. Browne, first vice-president; Mr. J. H. Brickenstein, second vice-president; Mr. Eugene G. Mason, secretary, and Mr. Langdon Moore, treasurer. These officers, together with Messrs. James M. Spear, H. E. Peck, W. B. Kerkam, A. S. Steuart, T. E. Robertson and W. S. Hodges, constitute the board of managers.

Hearing in Boston on Electric-Vehicle Charging Equipment

A hearing was given at Boston, Mass., recently by Fire Hazard Commissioner James H. O'Keefe to a group of representative electric-vehicle, insurance and central-station men upon proposed regulations governing the installation of electrical equipment in garages in the Boston metropolitan district. President Day Baker of the Electric Motor Car Club of Boston marshaled the following list of speakers on behalf of a set of proposed regulations designed to afford safe operating conditions without handicapping installations of electrical apparatus: Messrs. W. H. Blood, Jr., insurance expert of the National Electric Light Association; J. A. Hunnewell, chairman New England Section Electric Vehicle Association of America; F. A. Barron, C. M. Greene and A. H. Abbott, of the General Electric Company; T. J. Pace, of the Westinghouse Electric & Manufacturing Company; C. H. Miles, Edison Electric Illuminating Company of Boston; I. Osgood, Boston Board of Fire Underwriters, and G. S. Lawler, Factory Mutual Fire Insurance Companies, Boston.

The proposed regulations provided that switchboards and charging panels in garages containing gasoline must have all circuit-opening devices either placed at least 4 ft. above the floor or inclosed with a wire screen of not more than No. 14 mesh, or they must be installed in a separate fireproof room or inclosure provided for this purpose. It was also provided that motors or dynamos not actually a part of a vehicle, if not placed at least 4 ft. above the floor, must be of the fully inclosed type, and that motors installed above the floor, if not of the fully inclosed type, should be provided with a wire screen of not over No. 14 mesh over the opening at the commutator end. The speakers stated that, so far as had been learned, no garage fire had ever originated from electric charging apparatus, and that the adoption of the proposed rules, which compare closely with similar regulations in New York and Chicago and which the various electrical interests are prepared to recommend for adoption in the National Electrical Code, will entirely safeguard garages from the electrical fire hazard.

Commissioner O'Keefe stated that he was highly pleased with the method adopted by the electrical interests in presenting the matter and that he would weigh all the arguments and adopt rules that would protect the community against undue fire hazard, without interfering with business.

New York Electrical Show

With almost 100 different companies and societies represented, the New York Electrical Exposition and Motor Show opened at the Grand Central Palace Oct. 7, and, judging from the large attendance and the keen interest shown in everything electrical on the opening days, the show promises to be the most successful of its kind ever held. All the exhibitors evinced a spirit of optimism, and there was generally a feeling that business confidence is being again felt.

One of the noteworthy features of the exposition is the prominent part that the United States government is taking in the various displays. Apropos of the universal interest being taken at present in war and its developments, the exhibits of the Army and Navy Departments are particularly timely.

The various uses to which electricity is being put in the manufacture of cartridges is shown in an exhibit from the government arsenal at Frankford, Pa. The different processes are demonstrated, from the drawing of the brass shell to the loading and fixing of the steel-jacketed bullet. An interesting piece of apparatus of the army exhibit is a hand-operated generator for use by the signal corps. This machine is operated by two men and supplies sufficient energy for a field wireless outfit. Navigating appliances, steering devices and a signal system make up part of the naval demonstration. The wireless equipment of a ship-of-war is demonstrated by a class from the Brooklyn Navy Yard. What is left of the lighting generator used on the United States ship *Maine*, which was destroyed in Havana harbor, is also on display. The Treasury Department is represented by a fully equipped mint from the United States establishment in Philadelphia. This exhibit shows the whole process of coin production from the melting furnace to the stamping and weighing machines.

Among the commercial and industrial booths those of the Edison Electric Illuminating Company of Brooklyn, the New York & Queens Electric Light & Power Company, the New York Edison Company and the United Electric & Power Company—the four large central-station companies of New York—are of interest. The Westinghouse Electric & Manufacturing Company and the General Electric Company and its affiliated concerns are also well represented. Numerous other manufacturing companies have booths, and practically every phase of the electrical industry is represented in

one way or another. One of the interesting features of the show is the automobile track, on which are demonstrated various types of electric vehicles.

AMERICAN ELECTROCHEMICAL SOCIETY

Highly Successful Convention Held at Niagara Falls—Abstracts of the Papers Presented—Interesting Practical Demonstrations

The twenty-sixth general meeting of the American Electrochemical Society, held in Niagara Falls on Oct. 1, 2 and 3, proved exceedingly enjoyable and successful. A novel feature of the professional session was a symposium on the practical side of electrochemical investigations. The attendance was over 200.

The first session was called to order by President F. A. Lidbury in the convention hall of the Clifton Hotel. In the afternoon of Oct. 1 an excursion was made to Foster's Flats, near the Whirlpool Rapids, while the evening was devoted to a most elaborate and lively smoker under the auspices of Section Q and its chairman, Mr. L. E. Saunders.

On Friday morning the works of the International Acheson Graphite Company were visited, where the pressing of large amorphous carbon electrodes and their subsequent transformation into graphite electrodes in electric furnaces were shown. The party then proceeded to the plant of the Niagara Alkali Company, where potassium chloride is electrolyzed in the Billiter (Siemens & Halske) cell. The products are caustic potash and chlorine gas, which is worked up into bleaching powder, hydrochloric acid and liquid chlorine. Finally one-half of the party visited the triple-plating department of the Spirella Corset Company, the other half the power house of the Cliff Electrical Distributing Company.

The second session was held at the Clifton Hotel on Friday afternoon. The evening was devoted to a banquet at the same place, followed by a brilliantly illustrated lecture on the physical nature of color, by Dr. C. E. Kenneth Mees, director of the research laboratory of the Eastman Kodak Company.

Abstracts of many of the papers presented follow. Others on "Base-Metal Thermocouples," "Determination of Radium," "Silicidized Carbon-Silfrax," "Electrolytic Insulation of Aluminum Wire" and "Electro-Percussive Welding" will appear in a subsequent issue.

Electrometric Titrations

A paper by Mr. Henry Ziegel, of Brookline, Mass., on electrometric titrations dealt with a possible technical application of the change in potential at the end point when a bichromate solution is reduced by a solution of ferrous salt. The change in potential in the ferrous iron-bichromate titration is about 0.2 volt or greater. The author has been successful in applying this change in potential to the regulation of the burette stopcock in such a manner that the stopcock closes automatically when the end point of the titration is reached. When the change of potential takes place immediate contact is made in a relay circuit.

Copper Electrode

A paper by Prof. Frederick H. Getman, of Bryn Mawr College, on the reproducibility of the copper electrode reaches the conclusion that of the various forms of copper electrode which have been studied that in which spongy copper is employed is the only form which is constant and reproducible. The irregularities observed with electrodes of massive copper and with electrodes of platinum covered with an adherent deposit of copper may be ascribed to a condition of metastability. The spongy modification of the metal is to be regarded as the stable modification under ordinary laboratory conditions.

Nickel Determination

A paper by Mr. W. Judson Marsh on the electrolytic determination of nickel discussed some difficulties experienced with the usual method of Classen and described a new electrolytic method which gives very satisfactory results.

Impurities in Cathode Copper

In a paper by Mr. Lawrence Addicks, of Douglas, Ariz., the sources of impurities in cathode copper were discussed on the basis of a large quantity of data collected from six large electrolytic copper refineries.

Impurities in refined copper may (a) cause a low electrical conductivity, (b) result in brittleness or weakness, or (c) be a source of loss of by-products of value. The first class is represented by phosphorus, aluminum, silicon, arsenic and antimony; the second by bismuth, lead, tellurium and selenium, and the last by silver, gold, platinum and palladium. It is further interesting to note that class (a) forms with copper alloys of excellent mechanical properties while class (b) is practically insoluble in copper, forming a brittle matrix around the copper grains in the cast bar.

From the refining point of view, impurities may be due to (d) electrolytic deposition, (e) inclusion of electrolyte in the crystalline structure of the cathode, (f) mechanical contamination from anode slimes suspended in the electrolyte and attaching themselves to the cathode, and (g) substances entering during melting from furnace, fuel and tools, and from other outside sources. It must be remembered that the finished copper is guaranteed to run at least 99.88 per cent copper, that it commonly does run 99.93 per cent in the melted bar, and that it is very unusual to find 0.01 per cent of any one impurity except oxygen, probably as cuprous oxide in solid solution, or possibly some other dissolved gas, such as argon or carbon monoxide.

From the author's careful analysis of his evidence, it appears that slimes, including electrolyte, and direct deposition all have a hand in the fouling of cathodes, but that it is not possible to assign definite values to each cause. However, the author has established a definite relation between arsenic and nickel in the electrolyte and in the wire bars.

In discussing the paper Dr. W. R. Whitney emphasized the importance of electrolytic copper refining for the electrical industries, as it is of utmost importance to make electrical apparatus as small as possible and as light as possible, so that the copper should be as highly conducting and therefore as chemically pure as possible.

Electroplating

The last four papers of the Friday afternoon session dealt with subjects of electroplating.

A paper by Prof. W. Lash Miller, of the University of Toronto, dealt with the formation of a badly conducting film on copper anodes in copper cyanide solution; one by Prof. Frank C. Mathers, of Indiana University, with the electrodeposition of lead from lead acetate solutions; one by Messrs. Frank C. Mathers and Barrett W. Cockrum with the electrodeposition of lead from lead lactate and lead formate solutions, and finally one by Messrs. Frank C. Mathers and Barrett W. Cockrum with the electrodeposition of tin from tin salts of mineral acids.

Evaporation in Electrochemical Plants

Mr. Otto Mantius, of Buffalo, N. Y., read a paper on the evaporation and the power problem in electrochemical plants. The principal object of the paper was to point out the economic and practical disadvantage of a high-

pressure straight triple effect when handling caustic liquor up to 50 deg. Baumé, and the good results that may be obtained from a compound or triplex condensing engine when working in connection with a double-effect evaporator or a combination of low-pressure triple effect and single effect with a cast-iron heating surface.

Symposium on the Practical Side of Electrochemical Investigation

The whole of Saturday was devoted to a symposium on the practical side of electrochemical investigation held at the FitzGerald Laboratories, which are ideally suited for this purpose on account of the splendid facilities available. The symposium consisted of informal demonstrations of apparatus, methods and materials used in electrochemical investigations or as aids to chemical investigations. Each demonstration was followed by an informal discussion.

Mr. F. A. J. FitzGerald showed the heating of a carbon rod and the formation of a fused silica tube from sand placed around the carbon rod, with a convenient arrangement of four transformers which can be connected up in different ways for furnace regulation.

Mr. L. E. Saunders showed a resistor furnace arrangement useful for melting point determinations, the charge in the chamber being heated by radiation from a resistor at the top in the form of a graphite plate sawed in such a way as to force the current to pass in a zigzag path through the plate. Mr. Saunders then showed the behavior of an amorphous carbon tube in short-circuit between graphite blocks in a 50-volt circuit. The construction of wire-wound tube and crucible laboratory furnaces with alundum as refractory was shown, the method of winding being demonstrated by Mr. J. B. Glaze. Nichrome ore is used as the resistor material for temperatures up to 1000 deg. C.

Mr. FitzGerald showed a 50-volt, 1200-amp arc furnace with graphite electrodes and demonstrated in it the melting of lime.

Mr. A. T. Hinckley exhibited a new refractory brick of the National Carbon Company called "vitrocarbon brick," which withstands temperatures up to 2400 deg. C. in a reducing or neutral atmosphere, and also a sample of a new heat-insulating brick.

Mr. Hinckley then demonstrated the method of measuring the resistance of joints of carbon electrodes screwed together.

Mr. E. R. Cole demonstrated the great ease of machining graphite and the production of the most varied forms of graphite articles for special purposes, for instance, the production of a resistor tube by sawing a special curve into a graphite tube, graphite terminals for mercury-arc rectifiers, etc.

Mr. Dantzisen showed a molybdenum-wire-wound alundum-tube furnace of the General Electric Company for temperatures up to the melting point of alundum (about 1900 deg. C.).

Dr. Carl Hering, of Philadelphia, Pa., exhibited a simple model of his pinch-effect furnace in which he demonstrated the melting of lead, the agitation produced by the "pinch effect" being clearly shown.

Mr. L. W. Chubb demonstrated the electro-percussive method of welding aluminum wires together.

Mr. Wile demonstrated an electric furnace for melting tin dross, in which the tin dross is melted below a layer of glass as resistor, while the two electrodes extend from above at the two sides into the glass in the furnace. The furnace has also been used for melting glass.

The Cottrell electrostatic process for the precipitation of solid particles from fumes was demonstrated by Mr. Landolt, of the Research Corporation. Direct current was produced by a special commutator at an emf of 40,000 volts. The demonstration was made successfully with zinc oxide, and later with phosphorus fumes.

Mr. Hinckley demonstrated a method for determining the rate of oxidation of electrode materials used for different purposes.

Mr. FitzGerald exhibited a tube furnace for melting point determinations in which the tube is embedded in granular carbon, which is the resistor. A thermoscope, using silver sulphide, was also demonstrated by the FitzGerald Laboratories.

After a hearty vote of thanks the meeting adjourned. The next meeting will be held in April, 1915, at Atlantic City, N. J.

MEETING OF EMPIRE STATE ASSOCIATION

Tungsten-Lamp Renewals and Variable Rates for Gas Among the Subjects Under Discussion

Tungsten-lamp renewals, meters, variable rates for gas, a review of the work of the last year and the election of officers were the matters which received attention at the annual meeting of the Empire State Gas and Electric Association held at the Engineering Societies Building, New York, on Oct. 2.

Hydroelectric Policy of New York

In his annual report Mr. James T. Hutchings, of Rochester, the president, discussed the work of the association during the last year and mentioned particularly the question of the hydroelectric policy of New York State. The association supplied information which was used in public argument by the member companies. Mr. Hutchings believes that this active campaign on the part of member companies had a great influence in the defeat of the public ownership plan of the Conservation Commission. The policy has been to maintain the position of the industry through frank discussion and presentation of the facts, and the executive committee believes that this policy should be continued, that the industry is of sufficient importance to receive attention at the hands of the State, and that the best manner of presenting the case is along straightforward lines such as were adopted in the case of the letter sent to Governor Glynn recommending for New York State the water-power policy adopted by the National Conservation Congress.

It is the belief of Mr. Hutchings that in the session of the Legislature to be held during the coming winter it will be possible to assist in the passage of sane legislation along conservation lines which will settle this vital question in the right way for the future. Representatives of companies should, wherever possible, ally themselves with such organizations as the National Conservation Congress and the New York State Waterways Association, as the influence of these associations has had a great effect upon legislative enactment for conservation.

Mr. Hutchings also spoke of the development of the gas and electrical industries and declared that each one should act separately in building up its own business. In conclusion he mentioned the effect which the war will have in lessening the supply of capital.

Mr. Stuart Wilder, Mount Vernon, N. Y., presented his report as treasurer, showing that the association is in excellent condition financially.

Report of Committee on Meters

The report of the committee on electric meters, which is composed of Messrs. C. G. Durfee, Rochester, N. Y., chairman, and S. G. Rhodes, was presented by Mr. Durfee. From the report of the meter committee of the Association of Edison Illuminating Companies and from

the remarks of Prof. Elihu Thomson, of the General Electric Company, the committee feels that there is good reason to hope for the production in the near future of satisfactory maximum-demand and integrating meters of small size at a considerably lower price than any now available.

The report was discussed by Messrs. S. G. Rhodes, H. W. Peck, F. B. H. Paine, E. M. Ellsworth, J. T. Hutchings and C. A. Graves.

Variable Gas Rates

Mr. Henry L. Coleman, general manager Empire Gas & Electric Company, of Auburn, N. Y., described variable gas rates. In order to obtain the maximum sales of gas it is necessary to adopt rates that place gas in the strongest competitive position with any other source of light, heat and power. Mr. Coleman outlined a system of rate-making that follows the ideas suggested by the Railroad Commission of Wisconsin in the case of the State Journal Printing Company versus the Madison Gas & Electric Company; that is to say, a division of the annual expenses into two classes of costs—first, those which bear relation to the number of consumers or meters, called consumers' expenses; second, those which vary with the number of cubic feet of gas used, or output expenses.

Engineers should be employed to analyze costs, and especially to arrive at a fair figure for consumers' expenses. Expense items that are considered to be wholly consumers' expenses should be definitely allotted as part of that cost. Interest, profit and depreciation on the value of service and value of meters are figured. Other expense items should be divided between the two expense classes as seems fair and just. The result of such an investigation in one town showed an annual consumers' expense of $6.04 per consumer. Upon this information a rate was made of 50 cents per month per meter consumer's charge plus 80 cents per 1000 cu. ft. for all gas consumed.

Mr. Coleman said that with a rate of this kind representatives would have a powerful argument for the use of gas for fuel. Such a system of rate-making does away with rates that might be regarded as special and discriminatory. The old sliding scale rate, in the opinion of Mr. Coleman, is less satisfactory than the system which he outlined.

Through discussion of a new rate-making plan by representatives of the company and newspapers, Mr. Coleman said that considerable publicity is obtainable. People who have not previously considered the many points involved will analyze costs in their own cases, and this is certain to be of estimable value to the new-business department. In one community where a system of charging similar to that outlined was established the rate is 50 cents per month per meter consumer's charge plus 90 cents per 1000 cu. ft. for gas. In summing up the operation of a system including the principles which he discussed Mr. Coleman emphasized the following points:

Uniform rates are economically wrong. Maximum sales depend on the competitive position of gas. Unprofitable consumers would pay at least what it costs to serve them. The profitable consumer would be relieved of the burden of the unprofitable one. Reductions in rate would be based on total net revenue instead of being made by the haphazard method previously employed. Lower rates would be possible, benefiting the whole community. New business would be acquired more easily and at less cost. A better standing before the Public Service Commission would result, as the rate is on a scientific basis. Better relations would exist with the public.

One part of the paper of Mr. Coleman was devoted to the subject of special rates for special uses. The speaker said that rates for gas and electric energy are more analogous to railroad freight rates than to any other class of rates. However, it has been thought proper in gas and electric industries to make rates according to the quantity used. Mr. Coleman thinks that rates based on this theory are discriminatory, but that it would not be a discrimination to give a lower rate for gas to a baker for baking bread than to a large dry goods store for lighting. A large amount of business can be obtained by gas and electric companies only when they make special rates for special uses. The only way to reach this business, in the opinion of Mr. Coleman, is to make rates comparable with railroad commodity rates; that is to say, rates are based on use.

The paper of Mr. Coleman was followed by a long discussion which brought out many points that were of interest to both the gas and the electric representatives. Among those who discussed the paper were Messrs. T. R. Beal, H. W. Peck, R. M. Searle, J. B. Klumpp, L. C. Purdy, A. D. Dudley, E. H. Palmer, C. G. M. Thomas, L. H. Sherck, William McClellan, C. H. Graf and J. T. Hutchings.

Tungsten-Lamp Renewals

Mr. J. W. Lieb, Jr., New York Edison Company, presented a paper on the subject of tungsten-lamp renewals. He first outlined the development of lamps and then stated the four methods by which renewals could be made. First, there could be free supply and renewals; second, the company could supply lamps at cost, foregoing any profit; third, the company could supply lamps at list prices, making a profit thereon; fourth, the company could refrain from handling lamps at all.

The paper of Mr. Lieb contained a full discussion of the various questions and considerations involved. He presented concisely and fairly the arguments advanced by the exponents of the different methods. One of the chief reasons which, he said, are advanced in favor of the policy of free supply and renewals is that this method gives the central station control of the lamp situation, enabling it to prevent the use of poor-grade lamps and the resultant poor service which follows.

In the discussion that resulted from the points suggested by the paper of Mr. Lieb some of those who were present expressed the opinion that the only way for a central station to retain control of the lamp situation, and therefore of the resultant service, is through the policy of free supplies and renewals. Others did not agree with this conclusion, but it was agreed by all who discussed the subject that it was absolutely necessary that the central station should control the lamp situation in order to protect the quality of its service. Those who discussed Mr. Lieb's paper were Messrs. J. C. De Long, E. H. Palmer, J. T. Hutchings, E. M. Ellsworth, L. H. Scherck, C. G. M. Thomas, H. W. Peck and J. O. Carr. At the conclusion of the discussion Mr. Hutchings asked that all of the member companies send letters to the executive committee expressing their views on the questions raised by the consideration of this subject.

Election of Officers

Mr. Whitney, of Oswego, then presented the report of the nominating committee. The secretary was instructed to cast one ballot for the nominees. The new officers are: President, Mr. J. C. De Long, Syracuse; first vice-president, Mr. E. H. Palmer, Geneva; second vice-president, Mr. Stuart Wilder, Mount Vernon; treasurer, Mr. H. W. Peck; secretary, Mr. Charles H. B. Chapin. Members of the executive committee to serve two years: Mr. A. B. Tenney, of Boston; Mr. G. M. Cole, of Plattsburg, and Mr. S. J. Magee, of Ithaca. Members of the executive committee to serve three years: Mr. J. T. Hutchings, of Rochester; Mr. C. H. Graf, of Albany, and Mr. William R. Huntley, of Buffalo.

REPORT ON SEATTLE MUNICIPAL SYSTEM

Objections Raised to Unit Costs Made Therein and to Rates for Street Lighting—Superintendent Ross Answers Criticisms

The lighting department of the city of Seattle, Wash., has recently issued its second report, which covers the years 1912 and 1913. Besides giving a condensed history and description of the property, the report contains a schedule of costs which shows the money spent for each part of the electric-lighting plant, as well as tables of unit costs of various kinds of construction work done by the department. The table printed herewith gives the total costs of each of the main subdivisions of the system and the cost per kilowatt of generator equipment. The rating of the generators is taken as the output on a 40 deg. C. temperature rise. In order to reduce costs to a unit basis, each item of the plant has a rating in kilowatts

COST OF SEATTLE MUNICIPAL POWER PLANT, DEC. 31, 1912

Division of Plant	Cost	Cost per Kw on Basis of 15,500 Kw Rating
Wood crib dam	$61,863.80	$3.99
Penstocks	299,471.59	19.32
Power station	354,387.44	22.86
Transmission lines	232,629.62	15.01
City substations	242,096.21	15.62
Lake Union auxiliary station	95,550.32	6.16
Total generating system	$1,285,998.98	$82.96
Commercial distributing circuits, with poles	$966,906.87	$62.38
Installations, meters, service lamps, motors, etc	616,416.25	39.77
Series street-lighting system	358,049.33	23.10
Cluster street-lighting system	398,165.94	25.69
Underground distributing system	125,797.73	8.12
Storeroom	774.44	.05
Total of distributing system	$2,466,110.56	$159.11
Total cost of plant, exclusive of new masonry dam, now under construction	$3,752,109.54	$242.07
Cost per hp at generators, on a basis of 20,800 hp rating:		
Generating system		$61.83
Distributing system		118.56
Total system		$180.39

assigned to it, and to simplify comparison the dam, penstock and generating units are rated in terms of the output at the generator. Detailed tables of unit costs for wires in place, poles, service and installations cover seven pages and were compiled by the department from the records of the actual cost of doing this work. During the last two years the number of customers has increased from 18,720 to 29,095, and in the face of two rate reductions the earnings have increased from $727,383 in 1911 to $910,477 in 1913.

A review of the financial statement, together with a synopsis of reviews and expenses of the lighting department from the years 1905 to 1913 inclusive, occupies the second half of the report, which is a 136-page document and is illustrated throughout with views of various parts of the system and of streets, commercial and industrial establishments, residences, public buildings, churches, etc., in which electricity purchased from the municipal system is used.

Accuracy of the Report Questioned

Shortly after the issuance of the report complaint was made that the hydroelectric cost data and much of the other information given in it were not founded on facts, and a member of the staff of the *Electrical World* was detailed to look into the matter. According to Mr. W. J. Grambs, of the Puget Sound Traction, Light & Power Company of Seattle, the report would give the impression that the municipal lighting plant has been constructed at a remarkably low cost. The method employed in arriving at the cost per kilowatt of the generating system, he maintains, was to take the total cost at the end of 1912 of the crib dam, penstocks, power station, transmission lines, city substations and the Lake Union auxiliary station and divide each of these costs by 15,500, the assumed rating of the generating system. In the report the crib dam is rated at 9000 kw, penstocks at 11,000 kw, generators in the Cedar Falls station at 13,500 kw, and the generator in the Lake Union auxiliary station at 1900 kw. Mr. Grambs said that at a recent hearing before the Public Service Commission of Washington, at North Yakima, the superintendent of the municipal system had testified that the penstocks would probably fail at 11,000 kw, even if the water were available, and that he had repeatedly stated officially, when urging the acquisition of additional water-powers by the city, that the system had reached its maximum output at 10,000 kw. As a matter of fact, the maximum output of the Cedar Falls plant as shown by the load data sheets kept in the generating stations occurred in November, 1913, and was 10,100 kw. Mr. Grambs said that the Cedar Falls station contains two 1200-kw units and two 4000-kw units, making a total of 10,400 kw, which should be the figure used in determining the cost per kilowatt of the system. For the purpose of the report the rating of the 4000-kw units is given as 5000 kw and the 1200-kw units are given a rating of 1750 kw, while the 1500-kw machine in the Lake Union station is rated at 1900 kw, making a total of 15,400 kw, which for the purpose of calculation has been raised to 15,500 kw.

The investment in crib dam, penstocks, Cedar Falls plant, transmission lines and substations, as given in the report for 1912, is $1,190,448.66. To this should be added certain items shown in the report such as transmission-line right-of-way, substation sites, etc., amounting to $29,397.28, making a total investment of $1,219,845.94, which on the basis of 10,400 kw gives a unit cost of $117.29 per kw of the generating system, exclusive of the Lake Union auxiliary plant. Moreover, the report shows that up to Dec. 31, 1912, $618,628.25 has been expended on a new masonry dam, which is being erected below the crib dam, and inasmuch as the contract calls for a dam carried up to practically the same height as the crib dam, the new dam will add very little to the present rating of the plant. The cost of this dam should be taken into consideration in arriving at the cost per unit in the plant. Mr. Grambs also pointed out that the cost of the Lake Union auxiliary plant is given at $6.16 per kw. This station is rated at 1500 kw and cost $95,550.32 up to Dec. 31, 1913, so that the unit cost would be $63.70. The load-factor of this plant is entirely different from that of Cedar Falls in that the water department, which owns the reservoir, will not permit water to be drawn for a longer period than two hours at a time without notice. The lighting department pays the water department 1 cent per kw-hr. for all energy generated at the Lake Union plant, and in 1913 54,500 kw-hr. were generated; besides this, 45,100 kw-hr. were purchased during the year from the Schwager-Nettleton Mill Company. Since the hydraulic development was made by the water department, and the lighting department installed the generating plant, the latter occupies the position of a purchaser of power. It would therefore be proper to capitalize a part of this charge of 1 cent per kw-hr. and get a unit cost. This should be added to the $63.70 per kw in order to arrive at a fair unit cost of the Lake Union station.

If the cost per kilowatt of the Cedar Falls plant at the end of 1913 be taken, the report shows that a total

investment of $1,282,301.42 was made, which on a 10,400-kw basis gives the cost per kilowatt as $123.30. In addition to this, there had been expended on the new masonry dam up to Dec. 31, 1913, the sum of $1,037,807.28. This would add $99.79 to the unit cost, making the total cost of the generating system $223.09 instead of $82.96 per kw. The report of the cost of the system includes the Lake Union auxiliary, and at the end of 1913, according to Mr. Grambs, the investment in the dam when completed to approximately the same height as the crib dam will be $1,250,000, so that the cost per kilowatt of the system will be $243.49.

Mr. Grambs also maintained that an analysis of the report would show that the average rate per kw-year paid by the municipality for street lighting is $189.99, while private consumers buy energy for lighting service at the average rate of $62.82 per kw-year. According to the report, the street lighting for lamps consumed 4,799,670 kw-hr. at the rate of 4.39 cents per kw-hr. Lamps are said to burn 4000 hours a year. With the prevailing rates private consumers using light in business houses for 4000 hours a year would be charged only 2.53 cents per kw-hr. On Oct. 9, 1912, the Puget Sound Traction, Light & Power Company offered to furnish energy for lighting the city of Seattle at its tariff rate of 2.75 cents per kw-hr., maintain the street-lighting system at its own expense and turn the same over to the city in first-class condition at the expiration of the contract, pay 25 cents per pin rental on city poles, and in addition offered to pay the city $40,000 a year as rental for use of the street-lighting system owned by the municipality.

While private consumers enjoy a rate of from 1.5 cents to 2 cents for energy for motors, public buildings pay a rate of 3 cents per kw-hr. for energy for lighting and 2.5 cents per kw-hr. for energy used by motors. In 1905, the last year in which the city lighting service was supplied by a private company, the city paid $66 a year flat for a 6.6-amp arc lamp. These lamps were purchased by the city when it took over the private company's street-lighting system and are still in use. According to Mr. Grambs, the data supplied by the superintendent for the municipal system show that the municipality is being charged $77.40 per lamp a year for this same service when the energy consumed is measured at the lamp and $89.33 per year if the energy consumed is measured in the substation.

Superintendent of Municipal System Defends His Figures

When these charges were brought to the attention of Mr. J. D. Ross, superintendent of the Seattle municipal lighting department, he said that his report was filed with every effort and intention to present the facts exactly as they were and intimated that Mr. Grambs' position with the competing Puget Sound Traction, Light & Power Company was responsible for his misconstruction of the figures given in the report. To get at a unit cost per kilowatt installed the basis taken was the 40 deg. rating of the machines. Each of the 4000-kw, 35 deg. C. rise machines, he said, is operating at over 5000 kw and is rated at 5000 kw 40 deg. C. rise, while each of the 1200-kw machines will run continuously at 1750 kw with 40 deg. C. rise. The Lake Union station, he said, delivers 2000 kw. With the new dam, now nearly complete, the penstocks, which would now fail at about 11,000 kw, will carry the full 13,500 kw without any change whatsoever owing to the raising of the lake and the shortening of the pipes.

The Lake Union plant takes its water from the overflow of the water department's reservoir, as stated in the report. The cost given includes $41,456.51 for a steel penstock from the reservoir to the plant. The station is intended for emergency use and seldom runs more than a few minutes during interruption to the regular service. The costs given do not include real estate or plant under construction, nor any store or office equipment. All the items included are listed with as much detail as possible, and no attempt, Mr. Ross claims, was made to make a showing of cheap construction. The actual costs were given with the hope of adding to the value of the report for engineers who might make use of the cost data. The unit cost of $117.29 per kw, as given by Mr. Grambs, based on a name-plate rating, is certainly not unreasonable, but is misleading because the real continuous rating of the machines is more, and rating them at 40 deg. C. rise is standard practice.

When the new dam is finished and added to the plant, and before any more generating units are installed, the unit cost of the system will certainly be raised. An ultimate development of 33,500 kw will cost about the same per kilowatt as the present plant. It is not true, Mr. Ross said, that the new dam will be the same in height as the old. The present contract calls for an elevation of spillway of 1590 ft., while the present dam has an elevation of 1550 ft. The new dam, which will cost $1,400,000, will be of solid masonry instead of timber and rock, so that the added safety is enough to warrant its being built, aside from the fact that it increases the storage sevenfold.

As to the rates charged by the lighting department to the city and to private consumers, the only deviation that is made from the printed schedule is to favor the water department, which pays 2 cents per kw for energy for motor service with no minimum charge, although the pumps run only a few months in summer. In no case is any city building paying more for energy than is shown on the printed schedule. As to the street-lighting rate, which is fixed by the City Council, this rate includes maintenance, fixed charges on the lighting system and operation, including replacement of globes and lamps. This service is not comparable to that furnished as "business lighting," which requires the customer to own and care for his lamps and fixtures. Very few arc lamps of the old type are now in use, most of them having been replaced with tungsten and nitrogen-filled lamps. The rate is now on a kilowatt-hour basis, which makes the arc cost more and the incandescent less than in 1912, the average being considerably less. The 400-cp nitrogen-filled lamp now used in place of the arc lamp will cost the city $45 per year in 1914. Mr. Ross states that the proposal of the Puget Sound Traction, Light & Power Company to furnish energy for street lighting failed to provide for depreciation of the system and for the great amount of new construction and reconstruction work necessary, and that the rental of $40,000 per year is inadequate. In answer to the charge of discriminatory rates the department asserts positively that with the exception in favor of the water department noted above there is absolutely no discrimination.

Franchise Agreement in Sandusky, Ohio

The city of Sandusky, Ohio, and the Sandusky Gas & Electric Company have reached an agreement, and a ten-year franchise will be granted. The company's last proposition, which was accepted, provides for a rate of 7 cents and 4 cents per kw-hr., instead of the old rate of 8 cents and 5 cents, with a reduction in the quantity that must be used in order to secure the smaller rate. The minimum charge was also reduced from 75 to 50 cents. The contention over rates has lasted for five years, and two municipal bond elections have been held, while a third was fixed for Nov. 3.

Export and Domestic Trade Conditions

Developments and Information Relating to the Commercial Problems Created for Manufacturers by the European Conflict

GOVERNMENT STUDY OF SOUTH AMERICA

Mr. H. N. Douthitt, Special Agent of Department of Commerce, Will Investigate Possibilities for Electrical Manufacturers

Mr. H. N. Douthitt, special agent of the Department of Commerce, has been in New York for two weeks and has met a number of manufacturers who are interested in his proposed trip to South America. Mr. Douthitt has returned to Washington, where he will be for a short time before leaving for Rio de Janeiro, Brazil, the first point which he will visit.

This trip by Mr. Douthitt is taken at the personal suggestion of Secretary of Commerce Redfield, who thinks that a representative of the government will be able to obtain much information that will be of value to American manufacturers of machinery. The investigations of Mr. Douthitt will be confined entirely to a study of the market in South America for manufacturers of general outside machinery and general engineering supplies, including electrical machinery and apparatus. Mr. Douthitt will look into the matter of equipment for machine shops, but will not make any investigations of markets for textile machinery.

In talking with a representative of the *Electrical World* Mr. Douthitt said that he had lived in Brazil for some time, where he was interested in hydraulic engineering projects. He speaks Portuguese. As the result of his experience he concludes that American manufacturers should seek markets in South America based on the high quality of the goods they produce. He thinks that the high quality of the goods is the best feature of American products and believes that this is thoroughly appreciated by men in South America who have traded with manufacturers of this country.

Mr. Douthitt spoke of some generators installed by a large American electrical manufacturing company at Bellohorizonte, State of Minas Geraes, Brazil, which had been cited all over that country as showing the superiority of American machinery. They had been in operation about fifteen years and had worn out two sets of blades on the turbine. When he last heard of the plant its operation was as satisfactory as at the beginning. If companies will do as certain of the large electric companies have, Mr. Douthitt said, and will try to market their products on the argument of the high quality which they are justified in making they will get, in his opinion, satisfactory results.

A great deal of unnecessary criticism has been heard about the packing of goods. Mr. Douthitt said that it was possible that small companies needed to heed the criticism, but the packing of the larger companies was as good as that of the German manufacturers.

The method which Mr. Douthitt will follow will include a call on the American consul in each city, with whom he will advise, and a personal canvass among users of heavy machinery. As far as possible he will get a thorough description of the machinery now in use, will find where it was purchased, what it cost and what is needed now. Mr. Douthitt will also discuss financial conditions frankly in the various countries in order to find out whether buyers are in a position to pay cash, or, if not, what terms of credit they expect and what the countries can offer to this country that may be taken in exchange for goods. Under present financial conditions Mr. Douthitt says that it is not a question of how much American manufacturers can sell to South American buyers but how much South American buyers will want to buy while financial conditions remain as they are.

Unless a manufacturer is prepared to have a representative remain for a year in South America without showing a profit on his sales, Mr. Douthitt does not advise any manufacturer to send a representative down there. He believes that it is advisable, however, for manufacturers who want to enter the South American market to secure their own representatives and not to try to do business through English and German commission houses, which already have extended connections with manufacturers in their own countries.

TRADE PROSPECTS IN CENTRAL AMERICA

Letters from Engineers and Business Men Regarding Opportunities for United States Manufacturers

Replies have been received by the McGraw Publishing Company, Inc., to letters sent to prominent engineers and business men in Central America asking for information in regard to business prospects.

Mr. Juan J. de Jongh, architect, Guatemala, says that the reasons why United States manufacturers have not had more Central American trade were of their own making. The United States should educate its young men; manufacturers should scrupulously carry out all contracts to the letter; traveling salesmen should be specialists in the branches they represent; payment in sixty or ninety days does not allow sufficient time; steamship freight rates are too high from the United States to Central America.

Mr. F. Maury Gillespie, San José, Costa Rica, says that the immediate needs for electrical apparatus are negligible as the present condition of affairs has put a stop to practically all projected works. With the exception of metallic-filament lamps and a few motors, the United States has practically all the electrical business in the country. With a few isolated exceptions every alternator in the country is of American manufacture. Telephones, arc lamps, etc., are practically all of American manufacture. He has not seen a single piece of hydraulic apparatus in the country that does not bear the name of an American manufacturer. One reason why European goods are preferred by many in Latin America is that the majority of American manufacturers act as if they were acquainted better with local conditions and requirements than people on the ground. One American manufacturer of electrical apparatus packed his goods in the best way of all the examples that Mr. Gillespie has seen.

Mr. W. T. Penny, Guatemala, writes that while the war in Europe has paralyzed practically all construction work, he believes that the general effect will be to make consumers and buyers turn more to the United States.

Mr. S. Vilar y Boy, Guatemala, writes that at present there is not much business to be done. The condition of best quality of American goods would not counterbalance their higher prices compared with European merchandise, especially German, in Guatemala because the depreciation of native money means a large demand for low-priced merchandise rather than for high quality.

HOW MANUFACTURERS VIEW THE OUTLOOK

Grounds for Reasonable Confidence in Regard to the Future Business Prospects

The following statements have been given by manufacturers to the *Electrical World:*

Looks for Better South American Trade

Mr. J. Nelson Shreve, treasurer Electric Cable Company, Bridgeport, Conn.: "Our business is one in which there is practically no export demand at the present time. England and Germany control the South American market and do not import any wire themselves. We are now receiving inquiries from various parts of Europe. We do not believe that South American countries will use as much wire this year as they did last, but whatever they do buy will have to be purchased in this country. We have already taken steps to develop export trade by circularizing South America, and we look for better business from that country in the near future. Most of our raw materials, setting aside the flurry in rubber, are arriving regularly, and we are only short a very small part of our supplies, for which we can readily substitute other materials without affecting our costs."

Optimistic Regarding Recovery

Mr. Henry B. Smith, secretary and treasurer Michigan Pipe Company, Bay City, Mich.: "Our company unfortunately has not a great deal of export trade. The writer has kept in touch in a certain measure with the recent developments in this connection brought about by the European disturbance, and, while there is no question about an enormous amount of trade being diverted from the European countries to the United States and flowing to the south, I do not think that it will in any way approach in volume the usual amount of export business which the United States has enjoyed to foreign countries outside of South America. Added to this is the psychological condition caused by the decided shock occasioned everywhere by the various declarations of war and subsequent unsettled condition of the warring countries. I am, personally, optimistic regarding our recovery from this shock, and think that it is already in evidence, but anticipate that it will take us the remaining three months of this year and possibly two months in the next year to realize fully anything approaching normal conditions again. Our business has been very poor this year, and in repeated instances we have worked business up to the point of purchase and then had the entire work delayed.

"We find that smaller towns are very conservative regarding buying, while last year we enjoyed a very good trade in this direction. We have not been dependent upon Europe for any raw materials, but are associated with some manufacturing institutions which are so to a certain extent. We refer to one company that manufactures hosiery. It is dependent on Germany for its dyestuff. This, of course, is entirely shut off, which will mean the education of the American people to the use of undyed materials, or—and this I hope for—the education of our chemical engineers in the production of these materials in our own country."

More Inquiries for Exports

Mr. J. E. Lonngren, Murray Wire Company, Newark, N. J.: "Some answers to your questions can be given as due entirely to the effects of war. There are other questions which in our opinion would have come up anyway, although the war may have hastened them. I am speaking simply of conditions as found by our company. Some materials that we use are imported. Soon after war was declared we found that we were unable to get any of these. We have been promised shipment of all we need except one, which is pure nickel. Regarding exports, would say that we had a number of inquiries before the war broke out and have had more since that time. It is a question whether the latter are due to the war or other conditions. I am frank to state that we will give the *Electrical World* credit for a great deal of it. We have no doubt that with closer relationship between our country and South American states we shall reap profits, with the rest of the manufacturers."

Looks for Improvement in Business

Mr. H. N. Fenner, president New England Butt Company, Providence, R. I.: "Our export trade is rather limited and to date we have not realized any effect of the war, although recent inquiries from London for machinery in our line built largely in Germany have been received. Our trade with South America has been limited and so far as we know there is a limited demand for our line from any source, although the demand for the product of our machines may require production in some of those countries. We have made no change in our organization or plant anticipating increase in business. We are not dependent on foreign sources for any kind of material in our business. We are looking forward for improvement in business in this country affected by the war in Europe."

ELECTRICAL NEWS IN GERMAN PAPERS

Increase in Prices by Electrical Manufacturing Companies Criticised as Economically Unsound

In the *Elektrotechnische Zeitschrift* of Sept. 10 (Nos. 36-37, containing twenty pages of text and twenty pages of advertisements) there is a note on "war and industry" signed by the initials of the editor (Mr. C. Zehme) referring to a statement of the commander-general of the Seventh Army Corps of the German army to the inhabitants of the provinces of Rhineland and Westphalia. In this statement it is emphasized that Germany needs its men not only for the war but also for maintaining some of the most important industries; that in order to make a successful issue of the war possible it is necessary above everything else to keep the coal mines of the district in full operation and in the same way the metallurgical works making war materials; but that it is also necessary to keep open the boat traffic on the River Rhine, the mills, the waterworks and the electric central station.

It is pointed out by the editor that the electrical industries have lost 25 to 30 per cent of their employees, who have gone to the front. Some departments of the industries had to be restricted, others had to be extended in operation. The editor thinks that in view of the importance of keeping the electrical industries in full swing, the recent raise of price made by several of the German electrical manufacturing companies is of doubtful economic soundness.

Under trade notes it is stated that the Gottfried Hagen Storage-Battery Company in Cologne has raised the price of plates and batteries by 10 per cent as a result of the rise in the price of lead.

On the front page the editors and publishers make the following announcement: "On the supposition that the mail facilities permit it, one number of the *Elektrotechnische Zeitschrift* will be issued at least every two weeks. We hope that political conditions will soon enable us to resume the issue of weekly numbers and in any case to bring the current yearly volume to a complete conclusion."

PUBLIC SERVICE COMMISSION NEWS

Maryland Commission

The commission is investigating reports that three Pennsylvania companies are supplying energy to consumers in Maryland without having submitted their schedules to the commission for approval. All of the companies under investigation have their plants just across the border line.

California Commission

The Railroad Commission has issued a supplemental order authorizing the Southern California Edison Company to sell $187,000 bonds to the Harris Trust and Savings Bank of Chicago. The bonds are to be sold at not less than 87½, and the proceeds will be used to discharge a note of $150,000 held by the bank. Any remainder will be turned into the company's treasury to be used in such manner as may be permitted by the commission.

Colorado Commission

A statement concerning the public utilities law which has become effective has been issued by the Public Utilities Commission of Colorado. The commission expresses the hope that its effort will meet with the approval of the public and will result in bringing the people and the utility corporations of the State into closer and more harmonious relations, to the lasting and enduring benefit of all.

Idaho Commission

The Public Utilities Commission has ruled, in a controversy over electric motor-service rates between the Marsh Mining Company of the Cœur d'Alene mining district and the Washington Water Power Company, that the latter company cannot discontinue service to the mining company while the rate case is pending. The power company wanted to discontinue service if the consumer did not pay its rates.

New York Commissions

At the hearing before the New York Public Service Commission, Second District, on Sept. 30, Mr. John L. Swayze, counsel for the New York Telephone Company, stated that he believed that the company would be able to submit a complete valuation and inventory of its property in New York City by June 1, 1915. He thought that he could give an estimate based not on the opinion of the experts but on his own judgment at an earlier date.

Mr. L. P. Hale, counsel for the commission, submitted inventories of the approximate value of the property of the company which were furnished to the commission in 1910.

Ohio Commission

Permission has been granted to the Massillon Electric & Gas Company to issue $118,000 of 5 per cent first-mortgage bonds at 80. The company told the commission that the poor condition of the market prevented it from selling the bonds at par. Permission had been given on Aug. 24 for the issue, but at that time the condition was attached that the bonds must be sold at par.

The Youngstown & Sharon Street Railway has filed a formal protest with the commission against the application of the Mahoning Electric Light Company for permission to issue $1,000,000 capital stock. The older company seeks to invoke the action of the clause of the law which gives the commission the right to decide whether there is public necessity for a new utility plant. The Youngstown & Sharon Street Railway alleges that there is not enough business in and about Youngstown for two companies. This company made an oral protest at the hearing on Aug. 26, and the written complaint is in support of that argument.

New Jersey Commission

The Board of Public Utility Commissioners has disapproved a proposed schedule of rates for electric lighting and motor service filed by the New Egypt Light, Heat & Power Company and calling for a charge of 18 cents per kw-hr. In holding this rate to be excessive the board suggests the following charges: Lighting, first 60 kw-hr. per month, 18 cents; all over such amount, 9 cents. Metered motor service, first 30 kw-hr. per month, 18 cents; in excess of 30 kw-hr. and up to 120 kw-hr., 9 cents; all over 120 kw-hr., 6 cents.

The board has approved the lease of the New Jersey Water & Light Company plant, Deal, Monmouth County, to the Atlantic Coast Electric Light Company, dating from July 1, 1914, and effective for ten years.

The board has handed down a decision favoring a proposed amendment of rates of the Standard Gas Company, particularly applying to Keansburg and Raritan Township. The company recently requested permission to charge a meter-rental fee of $5 for installations in temporary summer tents and bungalows, holding that the supply of service thereto, together with the cost of necessary service pipes, resulted in a loss. The evidence showing such fact, the board recommends a rule for the collection of $5 extra for service connections where the indications show that this will not be used for more than a season, thus broadening the company's proposal to include both meter rental and service installation costs.

District of Columbia Commission

The annual report of the Public Utilities Commission of the District of Columbia, covering the ten months ended Dec. 31, 1913, refers to the work of the electrical inspection bureau. This bureau is conducted at present by inspectors of the electrical department of the District of Columbia under the direction of Mr. Walter C. Allen, electrical engineer, District of Columbia.

The report says that the work of testing electric meters by public utilities commissions offers a problem very different from that of testing gas meters, for the reason that electric meters tend to run more slowly the longer they are in service, while the inaccuracies that develop in gas meters follow no such rule. It is thus more to the financial interest of a lighting company to test its meters periodically with a view to keeping them up to their correct rating. The result is that electric meters in service read much more correctly than gas meters, and therefore a much smaller number of complaints of electric meters is made.

Thus far the experience of the commission has borne out this fact, and it now appears that the principal work to be performed under this bureau will be that of approving the types of electric meters to be used in the District of Columbia, the testing of meters before installation on the premises of the consumer, and the testing of the apparatus used by the electric-lighting company for carrying on its periodic tests of electric meters.

Mr. Allen has submitted a report recommending regulations to be adopted by the commission concerning the types of meters to be allowed to be used in the District of Columbia and concerning regulations governing the testing of electric meters. These regulations are now under consideration.

Since the organization of the commission five complaints of electric meters have been received and the meters tested. In all of these cases the meters were found to be less than 4 per cent incorrect, which is the limit of inaccuracy allowed by the commission.

Current News Notes

Hydroelectric Service Reaches Windsor.—On the evening of Sept. 13 Hon. Adam Beck, chairman of the Hydroelectric Power Commission of Ontario, turned a switch which illuminated Windsor, Ont., with electric energy generated at Niagara Falls, 250 miles away. The ceremony marked the completion of the transmission line to Windsor, which is one of the longest in the world.

* * *

Electromagnets for War Surgery.—At the recent meeting of the French Academy of Medicine Dr. A. Dastre explained the uses to which a powerful electromagnet could be put in removing shrapnel splinters and steel-jacketed bullets from wounded soldiers. It is claimed that an electromagnet used by Professor Rolet drew shrapnel fragments to the surface from a depth of 6 in. and bullets from a depth of 2¼ in.

* * *

Thirty-fifth Anniversary of the Incandescent Electric Lamp.—Oct. 21 will mark the thirty-fifth anniversary of the invention of the incandescent electric lamp by Edison, and the day will be observed by many lighting companies throughout the country. It is interesting to note in this connection that in 1881 the lamp factory at Menlo Park was manufacturing 1000 lamps a day. In 1896 the output of incandescent lamps was 45,000 a day, while the output of lamps to-day is approximately 300,000 a day.

* * *

Commission Passes on Competitive Rates at Fort Wayne, Ind.—The Indiana Public Service Commission recently approved the competitive rate schedules filed by the municipal lighting station at Fort Wayne and by the Fort Wayne & Northern Indiana Traction Company, which has lighting and motor service circuits in the city of Fort Wayne as well as in many other Indiana cities. The rates of the municipal plant vary on a sliding scale from 7 cents per kw-hr. to 3 cents per kw-hr., while those of the privately owned company range from 7 cents a unit to 2 cents a unit.

* * *

New Bedford Company Opens New Office Building.—An attractive new four-story office building was thrown open to the public on Sept. 29 by the New Bedford (Mass.) Gas & Edison Light Company. The new structure, which is situated at the intersection of Purchase and Spring Streets, is of mill construction with concrete exterior and marble interior furnishings. It adjoins a new electric garage maintained by the company for general vehicle service, with charging facilities for twenty-seven machines. Nine electric vehicles are now owned and operated by the company, which has taken up this development with sustained enthusiasm.

* * *

Electric Show at Kansas City, Mo.—A fall festival electric show was held in the electric shop of the Kansas City Electric Light Company, Oct. 1-10. The leading manufacturers of electrical equipment had sections on the main floor for the display of their products, which embraced all of the numerous devices classed under household appliances. Special demonstration days were arranged as follows: Oct. 5, wash day; Oct. 6, ironing day; Oct. 7, housecleaning day; Oct. 8, "thé dansant," when the more delicate dishes were given prominence in the cooking demonstration; Oct. 9, baking day for ranges and small ovens; Oct. 10, "matinee maxixe."

Autumn Show-Window Displays.—A number of attractive window-display designs for central stations and electrical dealers have been prepared by the Society for Electrical Development, 29 West Thirty-ninth Street, New York, which intends that these designs shall be used to encourage "the buying spirit" already in evidence on the part of the public with the return of cooler days. After nightfall the windows of the electrical dealer, contractor, jobber and central station, it is pointed out, should be the best illuminated on the street. The display-service bureau of the society is ready at all times to answer inquiries in reference to show-window interior or exterior store display, show-window construction, show-window backgrounds and show-window lighting; decorative materials, home-made display fixtures, show-card writing suggestions or show-card writing supplies.

* * *

SOCIETY MEETINGS

Luncheon Meeting of Jovians at Lexington.—At the first noonday luncheon meeting of the Jovians in Lexington, Ky., this fall a paper was read by Mr. G. C. Hyde, of the Kentucky Utilities Company, on "Transmission and High-Tension Wires." The paper was read after the luncheon, which was held in the Phoenix Hotel.

* * *

Railway Electrical Engineers to Meet in Chicago.—The semi-annual convention of the Association of Railway Electrical Engineers will be held in Chicago at the Hotel La Salle, Oct. 26 to 30. The program will consist almost entirely of business meetings and reports of committees. Some of the engineering topics to be covered are: electrical headlamps, industrial trucks, electric traction, wire specifications, axle equipment, standard car wiring, railroad yard lighting and storage-battery charging.

* * *

Small-Plant Men to Talk in Ohio.—The new-business co-operation committee of the Ohio Electric Light Association will hold its next meeting at the Hotel Gibson in Cincinnati Nov. 18, 1914. The program as arranged is as follows: "Electric Heating," by Mr. W. Rollins, of the Simplex Electric Heating Company; "Vital Points in Power Sales Work," by Mr. R. A. McGregor, Toledo, and four ten-minute talks by representatives of small central stations near Cincinnati on electrical advertising, wiring old houses, method of selling electric-heating appliances, and method of securing power business.

* * *

Telephone Pioneers of America.—The fourth annual meeting of the Telephone Pioneers of America will be held in Richmond, Va., on Oct. 29 and 30, 1914, with headquarters at the Jefferson Hotel. On Oct. 29 the morning session will be a business meeting, and in the afternoon papers will be presented. In the evening the annual banquet will be held at the Jefferson Hotel. On Oct. 30 a special steamer will leave Richmond at 9 a. m. for a day's trip on the James River, reaching Old Point Comfort for dinner at the Chamberlin Hotel. At 7 p. m. the trip will be continued by night steamer to Washington, where the meeting will disband. The American Telephone & Telegraph Company has invited members of the association, their wives or immediate members of their families accompanying them to be its guests at the banquet at the Jefferson Hotel, upon the day trip on the James River, at the dinner at Old Point Comfort, and on the night trip to Washington. Mr. Theo. N. Vail is president of the association.

Rebuilding a Double-Decked Generating Station

Rearranging and augmenting electrical equipment in a station of unique design during continued operation on a combined electric-lighting and railway system

VIBRATION defying the efforts of experienced turbine balancers for more than seven years has caused the Fort Wayne & Northern Indiana Traction Company to rebuild its main power house on Spy Run Avenue in the city of Fort Wayne, Ind. When the double-deck station was built in 1906-1907 it was expected that the short steam-header connections would be productive of economic operation to a degree unobtainable with other types of stations. However, at this time new units have been installed under a guarantee which insures a steam consumption considerably less than that of the older machines. This great decrease in steam consumption does not, of course, come entirely as the result of rearrangement of the station or because turbines now are so much more efficient than the turbines of seven years ago, but has arisen because the old arrangement was poor and because also some increase in turbine efficiency has been made.

When the station was put into operation early in 1907 the generating units consisted of twenty-five-cycle railway apparatus and sixty-cycle lighting equipment. The twenty-five-cycle equipment consisted of one 400-kw and two 1500-kw machines, and the sixty-cycle energy was generated by one 500-kw and two 1500-kw units. These machines all operated with forced ventilation, the heated air from the generators being delivered into the boiler room, since calculations showed that the amount of air needed for draft very nearly equaled that delivered from the generators. Each of the 1500-kw turbines exhausted into a pair of 24-in. Bulkley twin condensers, the 500-kw and 400-kw units being served by 18-in. and 16-in. condensers respectively. The circulating pumps for all units were manufactured by the Boyts-Porter Company, Connellsville, Pa. The exhaust steam from these pumps and all other station auxiliaries was passed through two 3000-hp Platt Iron Works feed-water heaters.

Each turbine carried its own exciter on the main shaft, all exciter units, however, being arranged for connection to a common bus. On the marble switchboard standing upon an overhead gallery was a single

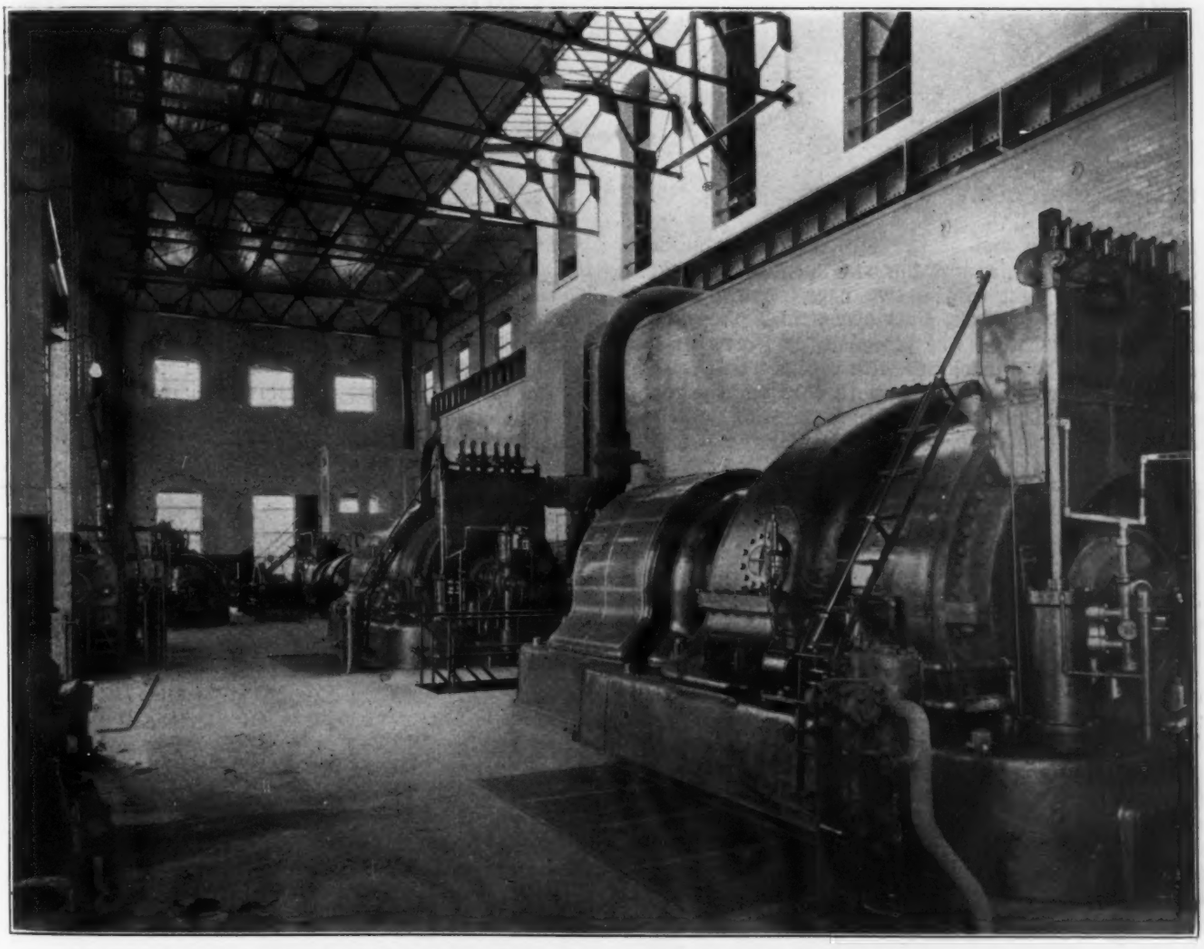


FIG. 1—NEW GROUND-FLOOR TURBINE ROOM, REPLACING DOUBLE-DECK CONSTRUCTION

set of buses for twenty-five-cycle energy and a set for sixty-cycle energy. All 33,000-volt apparatus was, and still is, installed at the south end of the station, six 375-kw transformers being set in brick compartments under the high-tension switching equipment.

As the first step in the reconstruction an addition measuring 60 ft. by 185 ft. was made on the east side

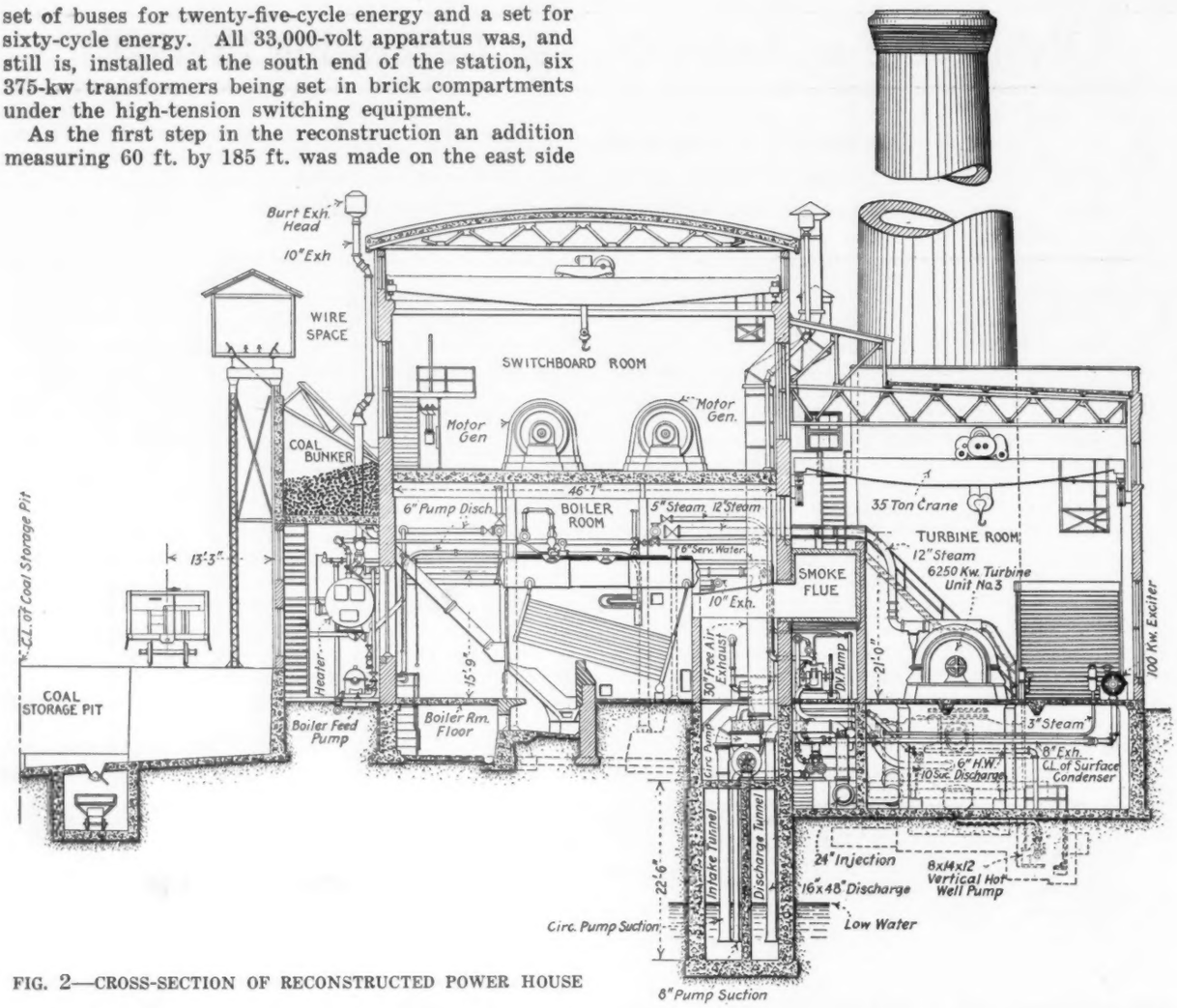


FIG. 2—CROSS-SECTION OF RECONSTRUCTED POWER HOUSE

and at the south end of the former station building. Excavation for this addition was begun in August, 1913, and the first of the two new General Electric 6250-kva, 2200/4000-volt, sixty-cycle, three-phase, four-wire turbo-generators was placed in operation in January, 1914. These machines with exciters on the same shaft were purchased primarily to care for the growing sixty-cycle load, but used in connection with two 1400-kw, 2300/600-volt motor-generator sets and a 1000-kva sixty-to-twenty-five-cycle frequency changer the sixty-cycle alternators may carry the entire system load at night. Both the motor-generator sets and the frequency changer have been placed on the old turbine-room floor, occupying the former site of one of the twenty-five-cycle turbines. For emergency excitation or other direct-current service a General Electric 100-kw turbo-generator has been installed. This unit is of sufficient rating to supply excitation for the field coils

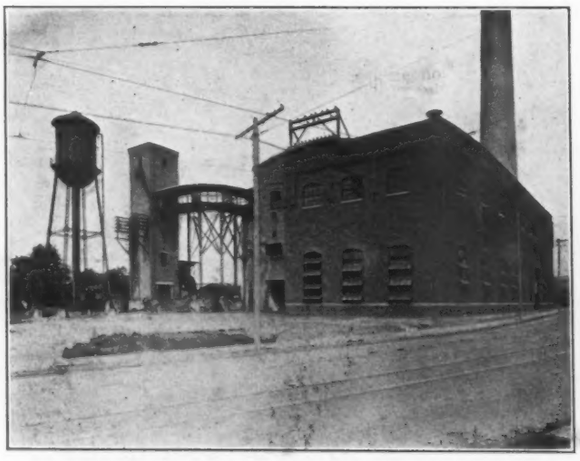


FIG. 3—EXTERIOR VIEW OF POWER HOUSE

FIG. 4—LOCOMOTIVE CRANE AND COAL CRUSHER

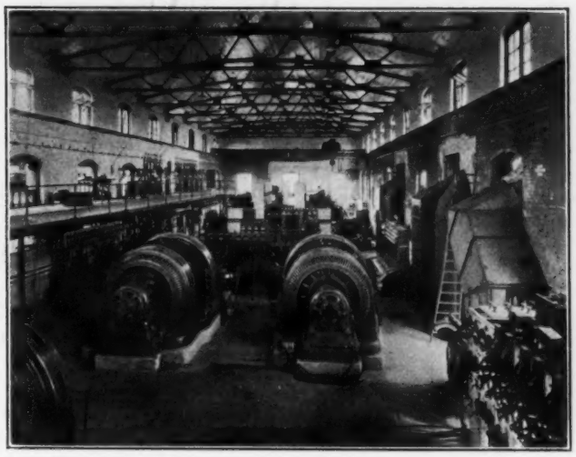


FIG. 5—VIEW OF FORMER TURBINE DECK

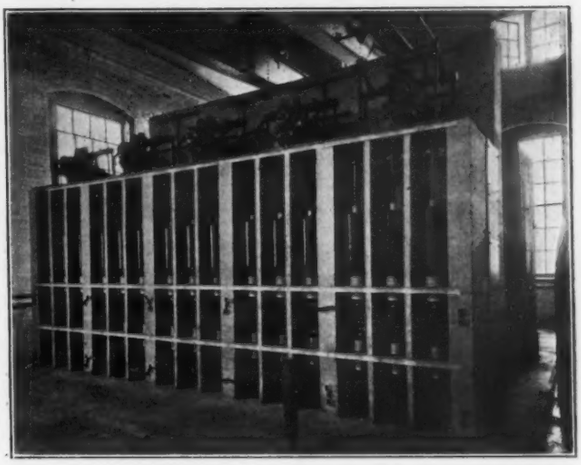


FIG. 7—SWITCH-CELL STRUCTURE

of all four station generators. Near this machine a three-panel switchboard, with rheostats in the rear, meters and controls the direct-current output of the machine.

Worthington condensers of the three-pass type with 12,000 sq. ft. of cooling surface receive the exhaust steam from the two sixty-cycle turbines and maintain approximately a 28-in. vacuum. Circulating water is taken from the Maumee River and forced through the condensers by Laidlaw-Dunn-Gordon steam-driven pumps. These engine-driven pumps have been placed under the smoke flue on the new turbine-room floor. Here they are unobtrustive, being partly hidden by wall panels, and yet are always under the watchful eye of the operators. It is interesting to note in connection with the old and new station auxiliaries that the circulating pumps for the new 6250-kw units are smaller than the ones used with the former 1500-kw machines. Gage boards on the wall panels carry instruments showing vacuum speed and steam pressure at each turbine.

While the changes were being made operation of the company's twenty-five-cycle, 33,000-volt lines made it imperative that one of the two 1500-kw, twenty-five-cycle turbines be kept running practically all of the time. During periods of very light load, however, the system could be operated from the steam station at Lafayette, Ind., 109 miles distant. To insure continuity of service while the two turbo-generator units were being moved from the upper deck to the new turbine-room floor only one was taken out of service at a time. As each machine was dismantled the pieces were lifted by a 20-ton electric crane and then lowered through a 15-ft. by 20-ft. hole cut in the northwest corner of the turbine deck. Here all heavy pieces were loaded upon a flat car and transported by means of a spur track to the new portion of the station. Condensers and other turbine auxiliaries were also moved to their new position in like manner, the condensers being placed beneath the turbines and the circulating pumps being set on the turbine-room floor beside the unit which they serve. Although the 1500-kw, sixty-cycle machines have been removed from service, they are still in the turbine room, no provision as yet having been made for their disposal.

Switching Equipment Grouped on Former Turbine Deck

Practically all of the control and switching apparatus in the station, with the exception of the 33,000-volt equipment, has been rearranged and augmented, and it is planned that eventually all switchboards shall be on the former turbine floor. All multiple-gap lightning arresters have been supplanted by new units of the aluminum-cell type, and sectionalizing switches have been added to allow the long Lafayette and Bluffton

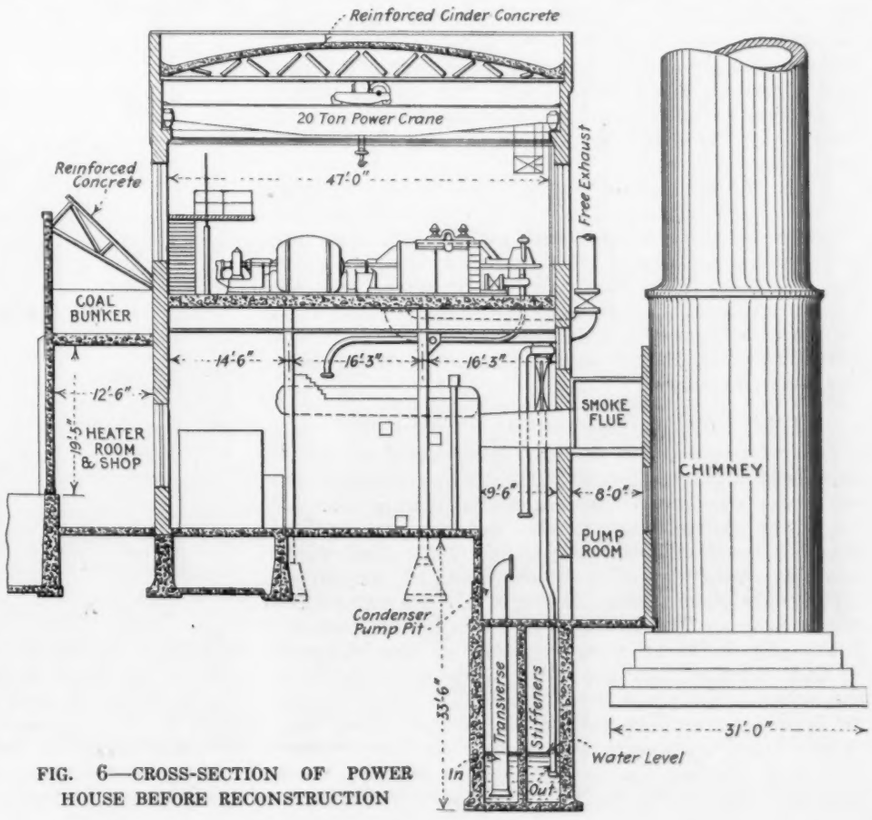


FIG. 6—CROSS-SECTION OF POWER HOUSE BEFORE RECONSTRUCTION

lines to be separated in case of trouble. For the four turbines and the exciters a five-panel black benchboard has been installed, communication between the switchboard operator and the machine attendant being established through a set of push-button visual signals. In the switchboard room the signal dial is mounted on the benchboard, but below in the turbine room an iron

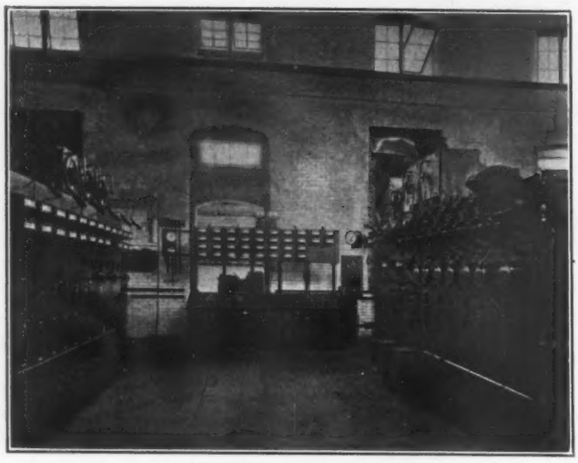


FIG. 8—THREE NEW SWITCHBOARDS

pedestal erected beside each turbine carries the indicating dial.

Concrete compartments erected on the former operating floor contain oil switches for each generator, motor-generator set, frequency changer and feeder. A blank compartment has been provided for switches to operate a future 3000-kva frequency changer. Although the old station had but one set of buses, the new bus and switching equipment has been installed in duplicate and arranged so that any or all apparatus may be transferred from one set of buses to the other without interrupting operation. Direct current for operating these switches ordinarily is taken from the 125-volt exciter bus, but in case this potential falls below a predetermined value a sixty-cell storage battery is automatically brought into operation to supply the energy for the operating circuits and emergency station lighting.

From the longitudinal overhead switchboard gallery all twenty-five-cycle railway feeder and transformer panels were moved to the south end of the former turbine floor and placed in such a position that the operator may look down into the turbine room from the board. Lightning arresters now occupy the former switchboard gallery and in this position occasion less hazard to workmen and operators than was the case with the old arrangement.

Condensers and Pump Operate in Air Chamber

One of the features of the reconstructed station is the combination ventilating air and noise chamber. Beneath the four main turbines and extending the full length of the addition to the building an air-tight chamber has been constructed with walls of wire lath and plaster. Entering at the south end of the station, cooling air is conducted through the generators and discharged into the boiler room through four separate ducts. By including a large portion of the basement in this chamber and providing large openings from the generators a great deal of the noise caused by the rotating elements is conducted into the basement. Two of the large condensers and several auxiliary pumps operate in this air chamber, attendants entering when necessary through an air lock. This arrangement renders the turbine room comparatively quiet, relieving much of the strain from the operators.

What Has Been Accomplished by the Change

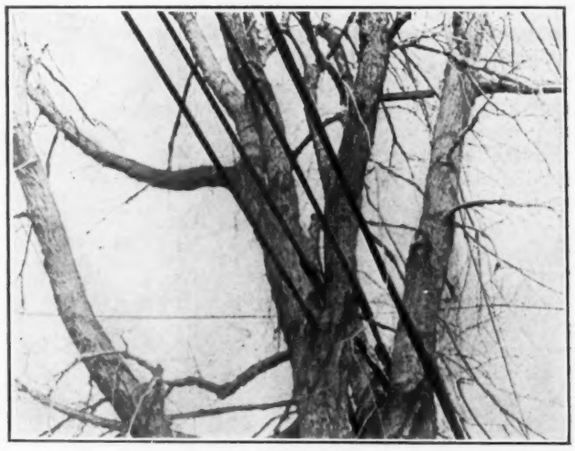
On the whole, the reconstruction of the station has resulted in many betterments. The turbo-generator sets have been placed on solid foundations and no longer give trouble due to vibration; the double-bus structure eliminates probability of service interruption from this part of the system; the noise of operating machines has been reduced to a minimum, and the over-all station efficiency has been greatly increased. Except for the addition of two 450-hp Babcock & Wilcox boilers, duplicate feed-water heater equipment and sectionalizing valves in the duplicate steam headers, and renewing the Roney stokers, no change was made in the steam end of the station.

The redesigning of the station was done under the direction of Messrs. Sargent & Lundy, Chicago, and the work of reconstruction was carried on under the supervision of Mr. E. S. Myers, chief engineer of the Fort Wayne & Northern Indiana Traction Company.

A Feeder Embedded in a Tree

The accompanying illustration affords evidence that wires and trees may, in some cases at any rate, long remain in intimate contact with each other without injury to the growth of the tree. The cables shown are all 500,000-circ. mil. railway feeders operated at 575 volts. The one seen furthest to the left in the picture was originally run through the crotch of the tree between the limbs. To protect the weatherproof insulation against abrasion due to the movement of the cable or the tree the cable was covered with a strip of wooden molding or "tree insulation." This wire was installed about eighteen years ago, but since that time the crotch between the limbs has closed up at the point where the cable lies, the tree meanwhile growing around the feeder so as completely to embed the cable in the wood. The cable will doubtless have to be cut at each side of the trunk when it eventually comes to be taken down.

In order to show the cables clearly the photograph



A 575-VOLT FEEDER EMBEDDED IN A TREE

was taken during the late winter. The leafless condition of the limbs does not, therefore, mean that the tree is dead. A good photograph could not have been taken in the summer time, since the wires are then too much hidden by the luxuriant foliage.

This interesting wiring "freak" was discovered on a road in Queens County, Long Island, N. Y.

Papers and Discussions at the I. E. S. Convention

Gas-filled lamps, lighting through glass ceilings, mine lamps, electric light in disease treatment, eye tests by illumination, photometric filters and other subjects reviewed

THE last two issues of the *Electrical World* contained an account of the Cleveland convention of the Illuminating Engineering Society, with abstracts of many of the papers and discussions. Following will be found notices of those papers and discussions not previously included.

Characteristics of Gas-Filled Lamps

Mr. G. M. J. Mackay presented a paper entitled "The Characteristics of Gas-Filled Lamps," in which were discussed the properties of tungsten as a filament material and the effect of shape, size and temperature of filaments and the pressure of gas on the color of the light emitted, length of lamp life and unity energy consumption. It was pointed out that as the temperature of a substance increases the radiation increases more rapidly in the shorter wave-lengths, and the wave-length of maximum emission is displaced more and more toward the blue end of the spectrum. For the smaller sizes of filaments it is much more economical to use mercury vapor around the incandescent filament than nitrogen. Attention was also called to the fact that the inside of an incandescent helix of tungsten emits more light than a black body having the same temperature, as about 50 per cent of light falling on the surface of the tungsten will be reflected. Between pressures of one-fifth to one atmosphere the heat conduction of nitrogen affects the energy consumed per candle-power emitted very little. Furthermore, the evaporation of tungsten at a pressure of 1000 mm of mercury is about 0.01 of what it is in a vacuum. The life of a gas-filled lamp is shortened and the efficiency reduced by using small-sized filaments. In closing, the author discussed Dr. Langmuir's method of measuring filament temperature by the intrinsic brilliancy.

Discussion

Mr. W. R. Rollinson, Cleveland, pointed out the fact that few of the new gas-filled lamps ever reach candle-powers as low as 80 per cent of their initial values, since they usually drop out of existence before suffering this loss in intensity. Dr. Worthing, Cleveland, explained that the end-loss to the terminals is much less in a coiled filament than it would be in a hollow cylindrical filament of the same outer diameter. Mr. J. B. Taylor, New York, suggested that the temperatures and colors of various parts of the filament could be easily studied by projecting an enlarged image of the filament onto a screen. Mr. E. J. Edwards, Cleveland, said that while the bulbs of the gas-filled lamps run pretty hot, the heat actually produced depends, of course, upon the watts rating of the unit and is identical with that for any other type of lamp of the same rating. In this respect the gas-filled lamp actually comes nearer to delivering "cold" light than does any other illuminant. The coiled form of the filament introduces a slight inductance, measured by Mr. Edwards as about 0.6 milhenry per lamp. The resulting power-factor of the lamp, said the speaker, becomes about 99.999 per cent, a value so near unity as to make the matter of power-factor altogether unimportant. Compared with the older vacuum-type lamps, which on double voltage would last only a few seconds, the new gas-filled units require almost triple pressure to cause them to burn out in the same time. Mr. W. A. Darrah, Pittsburgh, Pa., predicted that because of the absence of the limitations imposed by the incandescent lamp, such as melting of the filament at high temperatures, etc., some lamp of the arc type will be the ultimate high-efficiency unit of the future.

Lighting Through Translucent-Glass Ceilings

The lighting of special rooms through translucent-glass ceilings has been a difficult task from the standpoint of design, Mr. E. J. Evans declared in his paper entitled "The Lighting of Rooms Through Translucent-Glass Ceilings," owing to the lack of data regarding the properties of various glasses available. To eliminate spotted effect the glass must be more or less diffusing. The less diffusing it is, the narrower must be the spacing between the units or the higher above the glass must they be placed. The greater the diffusion, at least with the character of diffusion obtained with ordinary opal glass, the lower will be the efficiency of transmission. The ratio of spacing to mounting height is constant. The transmission efficiencies of the different kinds of glass vary considerably.

Discussion

Mr. A. J. Sweet, Milwaukee, Wis., defined specular, spread and diffuse reflection, and compared the corresponding phenomena of light transmission through media giving direct, spread and diffuse transmission. Rough crystal glass, for example, gives spread transmission, and the "spots" of lamps behind it cannot be avoided except by increasing the distance between glass and lamps, so that the spots "spread" and merge with other spots, making a uniform illumination. Where the distances available are short, opal glass should be used, said Mr. Sweet. This glass prevents spotting and yet has a transmission efficiency as high as 54 per cent. Mr. E. B. Rowe, Cleveland, Ohio, stated that opal-glass skylights appear flat and monotonous, while crystal glass gives an attractive and sparkling effect. Mr. W. A. Durgin, Chicago, Ill., said that for daylight transmission skylight-glass efficiencies should not exceed 20 per cent, else the intensity beneath may become unbearable. Mr. S. G. Hibben, Pittsburgh, Pa., suggested that amber tints might be obtained more efficiently with lower-efficiency yellow lamps than with tinted glass causing large absorption. Mr. J. R. Cravath said that opal glasses will doubtless be developed to give lower absorptions than the glasses now available. Prof. F. C. Caldwell, Columbus, Ohio, suggested using opal glass above to cut down the entering daylight, with crystal glass below to conserve and diffuse the light from artificial sources.

Requirements of Portable Mine Lamps

A brief history of the development in mine lamps, descriptions of modern portable lamps and references to investigations made of mine lighting by the Bureau of Mines were included in the paper entitled "Self-Con-

tained Portable Electric Lamps for Miners," by Mr. H. H. Clark. He pointed out that an ideal lamp should not be capable of causing gas ignition under any condition, should be reasonably light in weight and small in size, should give uninterrupted service for at least one shift, and should not be expensive to maintain in operating condition. The minimum value of light flux for hand lamps should be 3 lumens and for cap lamps 1.5 lumens.

Discussion

Mr. G. H. Stickney, Harrison, N. J., told of the limitations in weight, efficiency, hours' burning, etc., involved in the design of miners' lamps. Low-voltage lamps suffer a reduction in efficiency through the large heat-conduction losses at the ends of the filament. More difficulty is also experienced in making the product uniform than with high-voltage lamps. Mr. J. P. Langdon suggested the use of several cells in series, obtaining, say, 6 volts at the lamp. While involving a slight increase in weight, the filament end-losses would be reduced, enabling the center of the filament to be worked at a lower temperature for a given total lamp efficiency. Mr. R. P. Burrows, Cleveland, explained that the wide distribution of the beam from the miner's lamp—130 deg.—is made necessary in order that the workman may see about him in the mine chamber in which he works. The shot firers, on the other hand, need to have a relatively small area intensely illuminated.

Electric Light in the Treatment of Diseases

Dr. E. C. Titus stated, in a paper entitled "Some Uses of Light in the Treatment of Disease," that it has been found that the thermic effects of light extend to a depth of 2 in. or more below the skin, while convection heat is principally exerted upon the surface. The general application of phototherapy consists practically in the use of the electric-light bath. Among the conditions in which the electric-light bath has proved to be most serviceable are hardening of the arteries, gouty and rheumatic conditions, Bright's disease, diabetes, obesity and acute catarrhal affections of the respiratory tract. The effects of the baths are to induce intense hyperemia or reddening of the skin and to increase elimination by way of the lungs and skin. Local applications of light can be made by using an arc lamp in the form of a marine searchlamp with the glass front window removed or a 500-cp incandescent lamp with dome reflector.

Discussion

Mr. W. R. Mott, Cleveland, discussed the application of light from arc sources for the destruction of germs and the stimulation of the growth of healthy tissue. Prof. F. C. Caldwell, Columbus, questioned to what extent the observations in the paper represented simply the author's views and to what degree they represented the consensus of medical opinion. Mr. Robert Ely, Philadelphia, declared that many physician users of electric-light lamps, although protesting against the cost of operating carbon lamps, have found it inadvisable to install tungsten lamps on account of the lack of heat produced. Mr. J. B. Taylor, New York, remarked that since the body tissues are largely water, he thought that the deep penetration of the heat rays from the lamps was questionable.

Tests for Eye Fatigue

In a paper entitled "Some Experiments with the Ferree Test for Eye Fatigue," Mr. J. R. Cravath described a number of experiments with the method of testing for eye fatigue devised by Prof. C. E. Ferree. In this test the observer is required to gaze steadily for a short period of time at a card upon which are printed certain letters. These letters are of such a size that they are barely distinguishable at the distance selected for the test. During the period of time that the observer gazes at the letters he is required to record on a stop watch by the pressing of a button the intervals when the test appears blurred. The percentage of the time which the observer sees the letters blurred is taken as an indication or measure of the amount of fatigue of the eye at the time the test is made. The general plan was to test each observer in the morning when the eyes were presumably fresh and before any work was done and then after a number of hours of work. The results obtained from the various tests indicate that the Ferree method is reasonably sensitive both to eye fatigue caused by illumination and to eye fatigue due to other conditions such as abnormal eye strain, headaches, unusually difficult eye work, and irritation due to dust in the eyes.

Eye Tests with Different Illumination

Messrs. C. E. Ferree's and G. Rand's paper entitled "Further Experiments on the Efficiency of the Eye Under Different Conditions of Lighting" was a continuation of the papers presented before the I. E. S. in 1912 and 1913. In it were described methods of testing the ability of the eye to maintain its efficiency for a period of work, the loss of efficiency of the fixation muscles, and the comparative tendency of different conditions of lighting to produce discomfort. A report was also given of the effect on the eye of varying the area and, conversely, the intrinsic brightness of the ceiling spots above the reflectors of an indirect system of lighting; the effect of varying the angle at which the light falls on the work in a given lighting situation; the effect of using an opaque eye shade with dark and light linings with each of the installations of artificial lighting employed in this and the previous work; the effect on the efficiency of the fixation muscles of three hours of work under these installations; the effect of motion pictures on the eye at different distances from the projection screen, and a comparison of the tendency of different conditions of lighting to produce discomfort and to cause loss of efficiency.

Discussion

Prof. Morgan Brooks, Urbana, Ill., cited experiments from which he concluded that the visibility of fine type under high illumination intensities is due to the superior acuity of the contracted iris, rather than directly to the high intensity itself. Mr. W. A. Durgin, Chicago, expressed fear that any test results obtained would be in accordance with the subject's original prejudices, and also pointed out that to the office worker who prefers, for example, direct lighting the satisfaction obtained from this form of illumination may totally offset the effects of glare involved. Mr. G. H. Stickney questioned the value of fatigue as a means of measuring the usefulness of a lighting system, and Mr. E. B. Rowe urged co-operation with oculists in reducing eye strain. Mr. D. M. Moore, Newark, N. J., declared that acuteness of vision varies cyclicly with the heart pulsations and supply of blood to the retina. Prof. F. C. Caldwell reported tests at Ohio State University which showed for direct lighting a rapid rise in fatigue for intensities above 3 ft.-candles, whereas the fatigue curve for direct lighting was practically horizontal. At intensities of 6 ft.-candles the fatigue noted for direct lighting was several times that for indirect. Mental strain must be distinguished from fatigue, cautioned Professor Caldwell, else the former will become a factor in the results obtained by test. Dr. C. E. Ferree pointed out the care taken to insure the accuracy of tests by his method. Every possible safeguard that could be suggested by psychologists and others was adopted and it was found possible to duplicate observa-

tions without variations greater than 1 per cent—indeed, the best observers came within a range of one-half of 1 per cent.

Light Filters for Photometric Use

Eight new photometric filters making it simpler to compare lights of different hues were described in a paper entitled "Light Filters for Use in Photometry," by Dr. C. E. Kenneth Mees. It was found that these screens were valuable in setting up lamps to give certain efficiencies by color as they eliminate the necessity of using integrating spheres for determining the spherical candle-power. Curves showing the transmission coefficients of these screens at wave-lengths between 40μ and 70μ were included in the paper.

Discussion

The paper was discussed by Messrs. E. F. Kingsbury, Philadelphia; G. M. J. Mackay, Schenectady; L. J. Lewinson, New York; C. S. Redding, Philadelphia; H. E. Ives, Philadelphia; W. F. Little, New York; J. B. Taylor, New York; Clayton H. Sharp, New York, and F. E. Cady, Cleveland. Mr. Mackay stated that the temperature of lamp filaments can be checked with optical pyrometer and light filters to about 5 deg. between 2000 deg. and 3000 deg. C.

Color-Absorbing Solutions

The composition of a solution which will correct the light emited by any lamp, from a hefner unit to a gas-filled lamp, so that its intensity can be easily compared with that of a standard lamp was given in a paper on "Experiments with Colored Absorbing Solutions for Use in Heterochromatic Photometry," by Messrs. Herbert E. Ives and Edwin F. Kingsbury. A transparent tank for holding the solution was also described. The solution consists of 100 grams of cobalt ammonium sulphate, 0.733 gram potassium dichromate, 10 cu. cm of 1.05-gravity nitric acid, and distilled water to make one liter of solution at 20 deg. C. The methods of using and calibrating the solution were also described. A curve showing the transmission coefficient of the solution at different concentrations and at 20 deg. C. and methods of correcting two concentrations for temperatures between 15 deg. C. and 40 deg. C. were included.

Discussion

The paper was discussed by Messrs. F. E. Cady, Cleveland; T. H. Amrine, Harrison, N. J., and C. E. K. Mees, Rochester, N. Y. Mr. Cady remarked that the authors emphasized the need of some standardizing laboratory to supply colored filters or colored lamps to be used in obtaining a color match with any desired illumination. Mr. Amrine said that such difficulty was encountered in standardizing absorbing solutions that they had been abandoned by him.

Use of Characteristic Equations in Comparing Light Sources

In a paper entitled "Characteristic Equations of Tungsten-Filament Lamps and Their Application in Heterochromatic Photometry," Messrs. G. W. Middlekauff and J. F. Skogland gave an account of the difficulties experienced at the Bureau of Standards in calibrating lamps differing in color from the 4-watt per candle carbon primary standards which maintain the international candle. The authors proposed overcoming the difficulties of comparison by using tungsten-filament secondary standards. The intensity of these lamps can be measured at a match in color directly in terms of the primary standards, and their candle-power values at any other color determined from the corresponding measured voltages, by using characteristic equations which the authors have derived from the results of tests with tungsten lamps of various sizes and makes. In determining these equations the difficulties due to color difference were dealt with once for all. Tables of values computed by means of these equations were given for use in practical photometry.

Discussion

The discussion was participated in by Messrs. C. H. Sharp, New York; T. H. Amrine, Harrison; F. E. Cady, Cleveland; H. E. Ives, Philadelphia; P. G. Nutting, Rochester; H. S. Dunning, East Orange, N. J.; E. L. Clark, Cleveland; G. M. J. Mackay, Schenectady; J. B. Taylor, New York, and E. F. Kingsbury, Philadelphia. The desirability of eliminating heterochromatic comparisons from routine photometry was brought out.

Photometer for Measuring Transmission and Reflection Coefficients

A photometer for measuring the transmission and reflection coefficients of substances having small areas was described in a paper entitled "A Transmission and Reflection Photometer for Small Areas," by Messrs. P. G. Nutting and L. A. Jones. The chief advantages of this instrument are as follows: Errors due to fluctuation in the standard light source are eliminated by utilizing the same source of light for the comparison light and for the source of transmitted or reflected light; no corrections for a shift in the zero are required as the two beams can be balanced with an open system; the object sighted is directly visible at all times, and an open linear scale reading from zero to 100 per cent is employed. There was no discussion.

Measurement of Specular and Diffuse Reflection

In a paper on "Mixed Specular and Diffuse Reflection," Mr. P. G. Nutting discussed the old and new methods of measuring the reflecting power of different surfaces. Probably the simplest method of determining the specular reflecting power is to measure the total reflecting power and the diffuse reflecting power separately and take the difference. If the diffuse reflection is measured perpendicularly with illumination at an angle of 45 deg. or more, all the light specularly reflected is thrown out of the field and a maximum value for the specular reflecting power will be obtained. In other methods use is made of the fact that the specularly reflected light is almost completely plane polarized while the diffusely reflected light is quite unpolarized. Of the polarization methods, probably the best is that used by Professor Ingersoll in the construction of his so-called glarimeter. In this the area and distance of the source of illumination and the angle of incidence are fixed and the relative brightness is determined by viewing through a nicol prism in two different positions. The method of determining diffuse and total reflecting power separately is essentially a laboratory method in that it requires expensive instruments. It is, however, simple, rapid and precise. Ingersoll's method is probably best adapted to practical testing, while the total reflectometer method will prove useful in connection with total reflection work. This paper, the author declared, grew out of criticism in the *Electrical World* of Professor Ingersoll's article describing his "glarimeter" for determining relative specular brightness.

Discussion

Dr. M. G. Lloyd, Cleveland, said that an ink surface upon a white background may be so glossy that for particular positions of the observer the ink may appear brighter than the background. In reply to a question by Dr. P. W. Cobb, Cleveland, Dr. Nutting stated that the formulas given in the paper do not apply to such reflection as that of sunlight on water.

Reflecting Standards

The absolute reflecting powers of various reproducible surfaces were listed in a paper entitled "Tests of Some

Possible Reflecting Power Standards," by Messrs. P. G. Nutting, L. A. Jones, and F. A. Elliott. Among substances tested were compounds of calcium, aluminum, magnesium and boron, with smooth, matte, brushed and rough surfaces. The effect of size of grain on reflecting power was also determined. It was found that extremely fine powdered crystals gave the best results. Magnesium oxide heated to a high temperature in a vacuum furnace to remove water of crystallization had the highest reflecting power, namely, 88.1, of any substance investigated. On exposure to air the reflection coefficient fell to 86.4 and finally to 85.3. Among other substances considered sufficiently reproducible for reflection standards were barium sulphate, boric acid, magnesium carbonate, sodium sulphite and starch.

Discussion

In discussing the paper, Mr. M. Luckiesh, Cleveland, remarked that the brightness of a glare spot depends upon the brightness of the source of light, while the diffuse illumination depends upon the distance from the source.

The Integrating Sphere

Messrs. N. K. Chaney's and E. L. Clark's paper entitled "Notes on the Integrating Sphere and Arc Photometry" contained an exhaustive analysis of the characteristics of integrating spheres, as affected by screens and opaque bodies. A mathematical expression was developed for the error of integration, which contains factors depending upon the reflecting power of the sphere walls, upon the relative size and position of the screen with respect to the light source and to the photometric window, and upon the distribution of the light flux from the sources under comparison. Experimental data verifying the general theoretical conclusions were also given. The use of translucent screens and the photometering of extended light sources were also discussed. The conclusion was reached that translucent screens are not desirable and that extended light sources of sizes now common among modern arc lamps do not give erroneous values when photometered in a properly designed sphere.

Discussion

The paper was discussed by Messrs. C. H. Sharp, New York; S. L. E. Rose, Schenectady; G. W. Middlekauff, Washington; W. F. Little, New York; C. S. Redding, Philadelphia; F. E. Cady, Cleveland; T. H. Amrine, Harrison; C. W. Jordan, Philadelphia; R. C. Chillas, Jr., Cleveland, and E. L. Clark, Cleveland. Mr. Little presented results of experiments showing that either an opaque reflecting screen or a translucent screen can be used satisfactorily for ordinary photometric work. Mr. Little, Mr. Rose and Dr. Middlekauff stated that use is made of white alabastine as inner coating of the spherical photometers in the laboratories where they make tests, while Mr. Clark said that factory white has been found to give the best satisfaction in his photometer.

Acetylene Flame as Light Source

A burner for producing a cylindrical acetylene-flame standard light source was described and results of photometric tests on the flame were tabulated in a paper by Mr. L. A. Jones. It was shown that the most desirable pressure is 9 cm and the height at which the flame's intensity varies least is about 18.4 mm above the burner tip. The intensity of the flame does not become stable until about thirty seconds after being ignited. Among the advantages of this light source are its constant intensity, good quality, definitely known spectral energy distribution and its simplicity of construction and operation.

Discussion

The discussion was participated in by Messrs. E. L. Clark, Cleveland; C. H. Sharp, New York; H. C. Chapin, Cleveland; C. O. Bond, Philadelphia; S. L. E. Rose, Schenectady; M. G. Lloyd, Chicago, and F. E. Kingsbury, Philadelphia.

New Data on Visibility

Visibility data obtained from observations of twenty-one subjects, together with a formula representing the visibility curve, were included in Dr. P. G. Nutting's paper on "The Visibility of Radiation." The apparatus employed in securing the data consisted of a wave-length spectroscope fitted with a Whitman disk flicker photometer arranged so that the pure spectral hue and a white surface illuminated by a standard lamp were viewed alternately. The experiments covered observations between 0.40 μ and 0.70 μ. The visibility curve thus obtained conforms fairly well with the curve represented by the following formula:

$$v = V_m r^a e^{a\,(1-r)} \text{ where } r = \lambda \max/\lambda \text{ and } a = 181.$$

v_m is the ratio of the candle-power to the watt at the wave-length of maximum visibility. Methods of determining this ratio were described. The paper also contained references to works of others who have investigated the visibility of radiation.

Vision in Animals

Dr. H. M. Johnson in a paper entitled "Some Recent Experiments on Vision in Animals" described the results of visual tests with certain vertebrate animals. Each animal was placed in a situation in which he could be made to establish a discrimination habit. The method used was based on the fact that animals seek food and avoid punishment. It was determined that the monkey has visual acuity of the same order as that of man, while the visual acuity of the chicken is only 20 per cent to 25 per cent as good as that of the monkey and man. It was also found that the visual acuity of the dog is not over 4 per cent of that of the monkey and man.

Electrolysis of Reinforced Concrete

The cause of the cracking of reinforced concrete when the reinforcing material discharges current into the concrete has been found to be the formation of rust upon the anode. In the report of the committee on electrolysis at the Atlantic City convention of the International Association of Municipal Electricians, Mr. Leon Taylor, the chairman, said the Bureau of Standards found that this formation of rust takes place only at temperatures around 100 deg. Fahr., and that damage to the concrete is therefore not to be expected unless the density of the discharge is very high or some other conditions keep the concrete above the critical temperature. The addition of a fraction of 1 per cent of salt to concrete increases its conductivity and destroys the passivity of the iron, thus multiplying the corrosion many hundred times. Salt should, therefore, never be used in structures that may be subject to electrolytic action.

The passage of current from the concrete to the reinforcing material has been found to cause a softening of the bond between the iron and the concrete due to the accumulation of alkali there. The danger from electrolysis of concrete is greater where the current flows to the reinforcing material than where the current flows from the metal to the concrete. The passage of a current through unreinforced concrete has no effect upon the concrete other than that produced by the heating effect of the current. Electrolytic corrosion seems to be independent of the quality of the iron.

Operating Costs of Commercial Electric Vehicles

Further information on the plans of the Electrical World to collect, collate and publish authoritative information on cost of transporting freight and merchandise

LAST week's *Electrical World* contained some account of the campaign undertaken by this publication to secure authoritative cost data on commercial electric vehicles. In our search for these data it is not our intention to impose on the maker or user the task of making the calculations. These will be made by the *Electrical World*, and complete information which can be readily verified will be placed in the hands of the users and owners. By this process a double purpose will be accomplished—the owner will be furnished with a competent audit of his transportation accounting, abstracted and distinct from whatever particular bookkeeping system he may employ, and he for his part will be able to reciprocate by testifying as a qualified authority what his experience with his own particular installation has proved his operating costs to be.

As a matter of fact, the costs of electric vehicles in merchandise transportation are fairly well known to some few competent authorities who have made a business of furnishing analytical services to the many owners of large installations and to vehicle manufacturers. In this manner authentic and correct data have been accumulated, covering almost every possible class of service in the principal cities of the country. This information is, however, not available for use other than in a general way, because each investigation is undertaken with confidential obligations for protection of the interests involved. Nevertheless, there is a resultant educational advantage which qualifies those engaged in this work to determine what the cost should be where the general conditions of application are known.

Difficulties of the Investigation

It may be asked why, with the advantages of this general information on the subject, the questions at issue cannot be settled at once. They can and have been in very many cases, but there are a number of conflicting circumstances which tend to hamper their ready acceptance. First, as already stated, there are so many futile attempts being made in this general direction as to cause confusion as to which data are reliable and which are not, with the result that unless the figures bear the signature of the user they are not considered authentic. On the other hand, the user is not always in a position to testify what his costs are, for a number of reasons.

When horse-drawn vehicles were used exclusively it was not customary to keep accounts of stable and equipment service costs distinctly separate in bookkeeping systems from other business accounts. Consequently there was a lack of transportation-cost information. Later, when automobile sales activity commenced, stress was laid upon horse-service expense, and the facts in each instance were segregated with much difficulty, but without any serious endeavor to separate them permanently for future use. Subsequently, when machines were used on trial or partial installations made, little was done to provide for proper record-keeping. Therefore, when bills came in for the new materials required for their operation these naturally attracted attention and created the impression that the new expenses were greater than the old. Without any ready means for comparison a feeling of doubt continually existed as to what the real economy of the electric vehicle was. That the machines performed more work or rendered better service is evidenced by the constant additions made to the equipment, but these were made from superficial observation or by instinct, rather than from any scientific business deduction based upon an accurate knowledge of all the economic facts in the case. This has been proved over and over again wherever individual analysis has been made.

Hence it will be recognized that every executive in those progressive commercial organizations which have adopted the modern electric method of transportation will welcome this comprehensive effort of the *Electrical World* to place in his hands the means by which his individual cost of operating electric-vehicle equipments will be made evident to him. To intending users this information, impartially prepared and authoritatively vouched for, will be appreciated as a very practical insurance of stability of prospective investments.

Enterprise Must Be Based on Facts

In few cases in the business world are new ventures undertaken without all the facts being prepared in advance. "Will it pay?" is a prime question in every instance. "What are the facts and figures in the case?" "What have been the experiences of others?" are the fundamentals which every business organization desires before advancing funds. That so many commercial automobiles have been purchased without such advance assurances is simply due to the tremendous momentum of progress inherent in the commercial and industrial institutions in this country. Here a liberality of business enterprise permits and even fosters a limited amount of speculative undertaking in any direction where the use of new tools or equipment encourages a reasonable anticipation of operative improvement or economic business extension. However, there comes a time when reaction sets in as a matter of sound business principle, and a cautionary review of past performances becomes necessary. Further progress is checked until all elements of uncertainty are removed. Positive facts and figures alone can create confidence and lead to the extension of electric-vehicle equipment. Therefore information such as we have in preparation is certain to act as a stimulus in such situations.

The efforts of manufacturers to promote a knowledge of the cost of operating electric vehicles have been watched for many years with interest, and the *Electrical World's* espousal of the general cause with the idea of spreading the information broadcast should, as we have already good reason to believe it will, receive from the manufacturers universal approval. There is no denying the fact that if the economic principles and advantages attendant upon the employment of commercial electric vehicles were better established their general employment for nearly all city service would be forced upon all business men of sound judgment.

Our observation, particularly over the past decade, of

the progress of electric motor-vehicle business is that it is following the same course that characterizes all human effort in any direction which tends to build up a lasting development and which has the merit necessary to insure its permanency. Psychologists teach that initial efforts stimulated by enthusiasm resulting from the novelty of any undertaking produce extraordinary performances and accomplishments at first, and a curve graphically representing this accomplishment would go up with a sharp angle. Later, such a curve in its upward tendency would rise and fall with more or less obliquity, indicating the exhaustion and reaction which alternate when the struggle to proceed becomes more and more difficult and enthusiasm begins to wane. Periods of improvement are usually followed by stages of stagnation or retrogression. When little progress is being made the curve is flat and it is difficult to make it go upward unless some extraordinary pressure or influence is brought to bear to force further progress. The electric-vehicle business is at present in this position, and while general business conditions may have contributed largely to this situation it will be well for the responsible executive to recognize the natural or human factors also.

No more powerful influence can be exerted upon the present condition than a manifestation of the remarkable economy which can be effected in transportation by furnishing proof of the low cost at which electric vehicles are being actually operated. We are very much gratified with the hearty co-operation we are already receiving and which we hope will continue until we can place in the hands of each maker and user the concrete facts.

ELECTRIC PUMPING IN CHICAGO

Economies Effected by Substituting Electric Motors for Engines in City Pumping Stations

For many years the Fullerton Avenue pumping station in Chicago has been supplying flushing water from Lake Michigan to the city sewerage system through two 20-in. by 30-in. single-cylinder condensing engines. As installed with boilers, these two steam engines cost about $60,000 and were capable of pumping 9000 cu. ft. of water a minute. On June 7, 1912, however, the operation of the engines was discontinued, and a 75-hp, 220-volt, sixty-cycle motor operating at 496-r.p.m. was installed in their stead. Since Sept. 9, 1912, this motor, directly connected to a screw-propeller pump, has been delivering 24,000,000 gal. of water a day against a head varying from 9 in. to 15 in. In addition to the main motor, three additional 5-hp units have been installed to operate gate valves and a sump pump.

Energy for the electrical equipment is secured from a nearby substation of the Sanitary District over three 12,000-volt cables. For this service the city pays the Sanitary District $2.20 per hp a month, the horse-power charge being made on a basis of maximum demand.

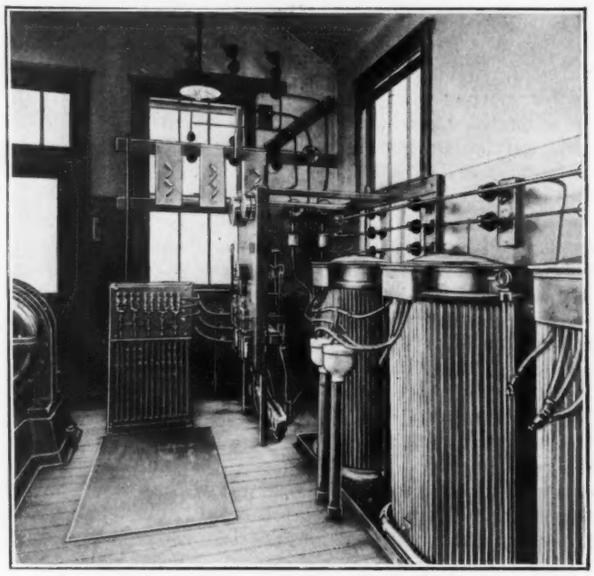
A glance at the accompanying cost data shows to what extent the electric service is responsible for reducing the water-pumping cost in the city of Chicago. While in the days of steam operation the cost ranged from $16,000 to $20,000, in 1913 it was approximately $3,000 for operation and repairs.

Another interesting and more recent application of motor drive to city water pumping is that installed at the Jefferson Park station. Here three gasoline-engine-driven pumps were placed in operation on Nov. 25, 1912. These pumps discharge water from the Lake View station into the outgoing main at approximately 60-lb. pressure. Each gasoline engine was connected to a direct-acting triplex pump.

Owing to the rapid growth of the northwestern section of the city, these pumps were unable to supply the demand for water and maintain the 60-lb. head, so on July 30, 1913, their operation was discontinued, a 100-hp, 2200-volt, sixty-cycle, 900-r.p.m. slip-ring induction motor being installed. To this unit was connected a centrifugal pump capable of delivering 3,000,000 gal. of water a day against a 45-lb. head. Energy for this unit is also taken from the mains of the Sanitary District and is delivered through two 75-kw, 12,000/220-volt transformers operating in open delta.

Comparative figures show that during the time the gasoline engines were in operation the monthly cost of running the station was $1,161. Since the motor-driven pumps have been installed this charge has been reduced to $265 a month.

During the first few months of electrical operation there were times when the motor-driven pumps supplied much more water than the system could absorb, and during such times the operators, opening a by-pass valve, allowed the pump to discharge a part of the water



JEFFERSON PARK PUMPING STATION, CHICAGO

back into the suction line. Mr. J. F. Chinlund, electrical engineer for the city, discovering this condition, however, caused a five-step Cutler-Hammer rheostat to be installed in the rotor circuit, each resistor step being arranged to provide a 5-lb. variation in the pumping head. Since this apparatus has been installed the operators are able to maintain a constant discharge pressure—namely, 60 lb.—and it is unnecessary to by-pass water. During the months that this control apparatus has been in service the pumping costs have been reduced further, now averaging about $210 a month.

EXPENDITURES FOR WATER PUMPING

Year	Operating Charge	Repairs
1906	$18,117.83	$1995.22
1907	20,391.43	3480.36
1908	16,796.60	3923.95
1909	18,759.29	1811.29
1910	17,982.25	1799.06
1911	14,071.36	1919.00
1912	8,060.45	470.48
1913	2,419.04	492.45

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

Obsolescence of the Unwired House

In pushing its wiring campaign this fall in the residential field, the Worcester (Mass.) Electric Light Company adopted a new plan in its newspaper advertising by discussing the decrease in value of the unwired house resulting from the demand of tenants for electrically equipped homes and the concession of these by builders. The company pointed out that of the hundreds of new buildings erected in Worcester last year only 2 per cent were unwired, and that of the buildings erected in the past three years probably over 95 per cent are electrically equipped. The company contended that this will gradually result in making the unwired house obsolete and a drug on the real-estate market. The company is continuing with success its plan whereby old residences are wired on the instalment basis, allowing a year for final payment. The work is awarded to local contractors, the company having no wiring department.

New Telephone Order System Used by the Commonwealth Edison Company

A new system of handling customers' applications by means of the telephone has been in operation in the contract department of the Commonwealth Edison Company, Chicago, for several months. It is a telephone order system and has been very successful in expediting the work of connecting up customers' installations to the central-station system. Already it has been subjected to the severe test of the moving-day rush of May 1, and its value has been demonstrated. Mr. E. W. Lloyd, general contract agent of the company, read a paper on the subject before the recent electric sales managers' convention at Association Island. This paper was prepared in rather elaborate and very attractive photographic form by Mr. Harold Wright, chief clerk of the contract department, assisted by Mr. A. R. Gerlach, the company's photographer. The data and

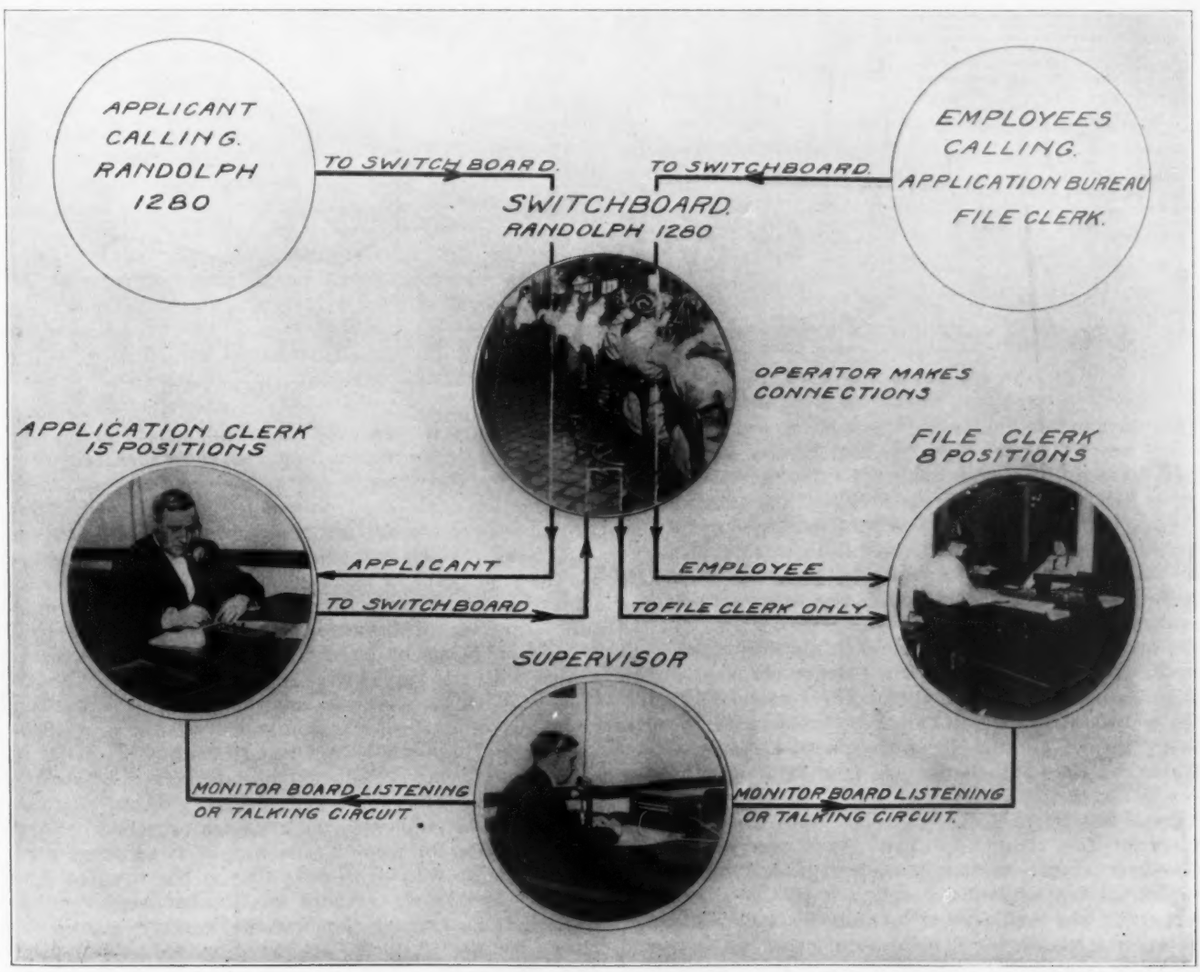


FIG. 1—DIAGRAM SHOWING TELEPHONE ARRANGEMENT OF THE APPLICATION BUREAU OF THE COMMONWEALTH EDISON COMPANY, CHICAGO

pictures given herewith are taken from this interesting paper.

Fig. 1 is a diagram showing the telephone arrangement of the application bureau. The applicant calling is connected through the Commonwealth Edison Company's general telephone switchboard to an application clerk. This man is constantly employed talking to the customers, and he is trained to talk courteously and clearly. If necessary, he obtains the information through the switchboard from a woman file clerk and informs the applicant of the status of the order. Provision is made by which the other employees of the company may communicate with the file clerks, and a supervisor of the telephone order system sits at a monitor board and can listen in to the conversation of any application clerk or any file clerk. There are fifteen positions for application clerks and eight for file clerks.

The application bureau enables the company to supply all applicants with authoritative information relating to pending orders in a courteous manner and in the shortest possible time. It is also equipped to take applications for residence service, to put through disconnect orders and handle cut-off orders, salesmen's calls or suggestions, changes in original orders, and to supply miscellaneous information relating to electric service.

To accommodate the large number of orders which must be handled during the moving seasons, it is necessary at the present time to have the city street numbers divided into eight divisions. The street-numbering system of Chicago lends itself to this classification. A classification by street numbers rather than by customers' names is believed to be more accurate, although the names are used for checking purposes. The file clerk files original orders, reads the reports regarding pending orders and removes completed orders. All the files are constantly checked by each file clerk to prevent errors. In order to provide a further check one clerk is constantly checking all files. The vertical filing system is used, the girls standing at tables with the files before them. The file clerks have head and breast telephones, so that both hands are free to manipulate the files.

The application clerks are men conversant with the policy of the company. They have received special schooling in the methods used in executing orders. Applicants for service are referred to the application clerks. If the applicant wishes service in a residence, the application is taken, the formal order to be signed when the representative calls. Should the applicant be a storekeeper or manufacturer, a salesman is assigned to make a call on the same day, or on the following day, depending on the time received. Orders to cut off meters, to read and disconnect meters and to make changes in the time of connecting service are taken and follow the regular routine of such orders. Miscellaneous information is also cheerfully and courteously given.

If an inquiry is received relative to a pending order, the applicant is requested to give his name, address and telephone number, and to "hold the wire." The application clerk then reverses the two telephone switch keys, in this manner holding the applicant on one line, and then requests the switchboard operator to connect him with the particular file clerk having charge of the division in which the applicant's street number comes. The application clerk then asks, "What is holding —— (street number)?" The file clerk answers, "What is the name?" to avoid giving incorrect information. If the name supplied by the application clerk agrees with the street number, the reason or reasons for the delay in making the connection are given.

Information necessary to keep the pending orders up to date is forwarded to the application bureau as soon as possible after the receipt of the orders.

The time required to read and answer an inquiry depends both on the ability of the application clerk to comprehend the applicant's question and upon the applicant's ability to talk over the telephone. The file clerk supplies the information required of her in from twenty-five to forty-five seconds, and usually the entire transaction consumes from one to one and one-half minutes. Where the applicant is not fully satisfied he usually asks for the manager. In this case the manager is the supervisor of the application bureau. In all ordinary cases the supervisor is able to satisfy the applicant that the information previously given is correct.

Eleven forms or blanks are used in connection with reports to the application bureau and to other departments of the company in connection with the status of pending orders. Each of the eleven forms is designated by a numeral to aid rapid handling.

Fig. 2 is a chart showing the telephone calls received by the application bureau from April 1 to May 22, 1914. As might be supposed, the peak was reached on April 30, when the number of calls was 2270. Fifteen application clerks were in service during the week of April 25-May 2. At other times the number needed is less.

Fig. 3 is a chart showing the number of calls per hour on May 5, 1914, compared with the number of men employed. It is interesting to note that the number of calls was greatest early in the forenoon, and that the secondary peak came at about 1:30 p.m.

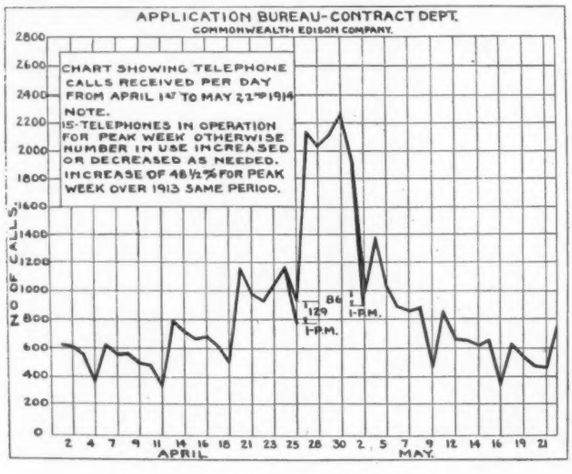

APPLICATION BUREAU-CONTRACT DEPT.
COMMONWEALTH EDISON COMPANY.
CHART SHOWING TELEPHONE CALLS RECEIVED PER DAY FROM APRIL 1ST TO MAY 22ND 1914
NOTE.
15-TELEPHONES IN OPERATION FOR PEAK WEEK OTHERWISE NUMBER IN USE INCREASED OR DECREASED AS NEEDED.
INCREASE OF 46½% FOR PEAK WEEK OVER 1913 SAME PERIOD.
NO. OF CALLS
T 129 1-P.M.
T 86 1-P.M.
APRIL
MAY

FIG. 2—CHART OF DAILY CALLS

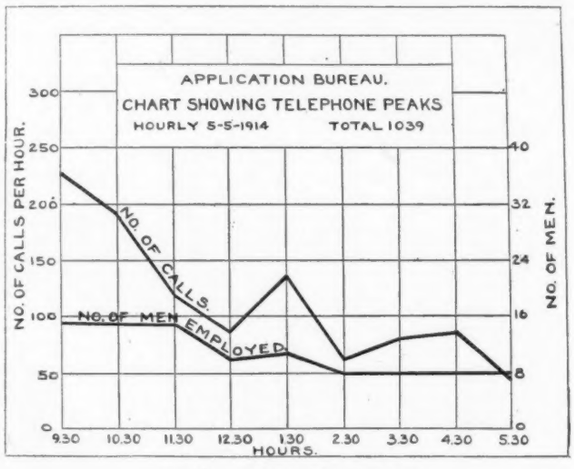


FIG. 3—PEAK-LOAD CHART

Illumination and Wiring

Terminal Insulators and Connectors for Traveling Crane Contact Wires

BY C. M. BENTON

For the average electric traveling crane, provided the contact wires are not too large, a No. 26 porcelain insulator can be used as a strain insulator, as indicated in Fig. 1. The galvanized-iron wire used for fastening the strain insulator to the termination fixture is passed twice around the groove of the insulator and its free end is made up about the main wire as shown in the illustration. The contact wire is passed once through the No. 26 insulator, after having been inserted through the hole in a punched steel washer, and it is then brought back again through the hole as shown. This arrangement will hold it firmly.

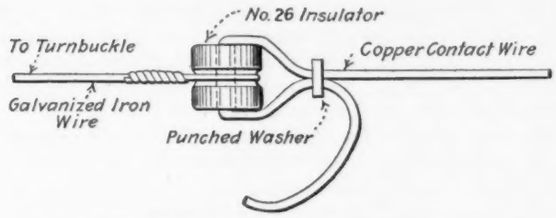


FIG. 1—NO. 26 KNOB USED AS A STRAIN INSULATOR

If the voltage impressed on the crane contact wire exceeds 125, two of the No. 26 insulators should be used in series between the contact wires and their terminal fixtures. For voltages higher than 250 three or more of the insulators can be used, but for such voltages it is usually preferable to use the brown glazed porcelain strain insulators that are designed for electric-light and street-railway construction. If the insulators of brown porcelain are not obtainable, those of the composition type can be applied.

Fig. 2 indicates the outline dimensions of the No. 26 insulators. Inasmuch as the hole through the center of this is $\frac{5}{8}$ in. in diameter, a large contact wire can be inserted through it, but as a general proposition it is not wise to use the porcelain insulator of the type shown for a contact wire having a diameter exceeding $\frac{1}{4}$ in. If one endeavors to bend a larger wire through the insulator, the probabilities are that the porcelain will be cracked.

A home-made strain insulator can be assembled, as shown in Fig. 2, from materials that are always available. The strain insulator shown is made by clamping between two strips of $\frac{1}{8}$-in. by $1\frac{1}{4}$-in. strap iron two No. 26 insulators; $\frac{1}{2}$-in. by 3-in. bolts can be utilized to bind the strips to the porcelains. This arrangement has certain advantages over one like that of Fig. 1, for which galvanized-iron wire is used to take the strain. In making up the iron wire there is always a possibility of nicking it with the pliers, which renders it liable to rupture when a severe strain is imposed. The two strips of the device of Fig. 2 are of such liberal section that there is no possibility of their breaking under any strain that they will ever be called upon to sustain. Furthermore, the arrangement at Fig. 2 has a better appearance. An iron link or one forged from round iron rod can be used to attach the insulator of Fig. 2 to the terminal fitting.

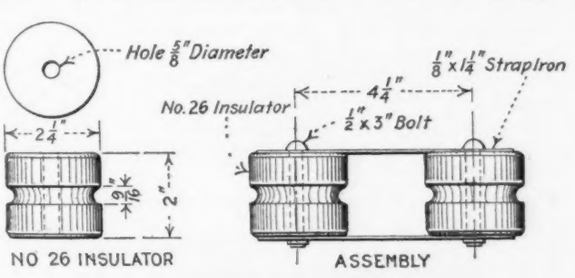


FIG. 2—A HOME-MADE STRAIN INSULATOR

Turnbuckles are frequently inserted between contact wires and the terminal fixture to provide means whereby the contact wires can be tightened. Obviously, strain insulators must also be used to separate electrically the contact wires from ground and from each other. The insulated turnbuckle of Fig. 3 provides both insulation and a device for tightening the contact wire. Although it has been applied for crane contact wire installations in but a few instances, there is no reason why its application should not be much more general. It is a commercial fitting and can readily be obtained through any large electrical supply house. The metal parts are of forged steel throughout. The absence of castings is a feature that will appeal to the practical construction man. The yokes in which the porcelain insulators fit are bent from channel-section steel and the turnbuckle itself is a drop forging. One of the bolts has a left-hand and the other a right-hand thread, so that when the turnbuckle is rotated in one direction the bolts are drawn together and when turned in the other direction they are forced apart.

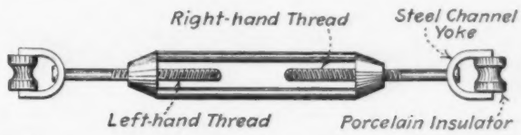


FIG. 3—INSULATED TURNBUCKLE FOR CONTACT WIRES

DIMENSIONS OF TUBULAR CONNECTORS FOR CRANE WIRIN
(See Fig. 4 for Illustration)

Number	*L*, Length in Inches	*D*, Outside Diameter in Inches	*d*, Inside Diameter in Inches	Largest Wire Accommodated	
				Solid	Stranded
1	1¼	11/16	.221	4	5
2	2	½	7/32	2	3
3	2¼	11/16	11/64	0	2
4	2½	½	½	00	1
5	2¾	11/16	9/32	000	00
6	2¾	1	½	0000	000

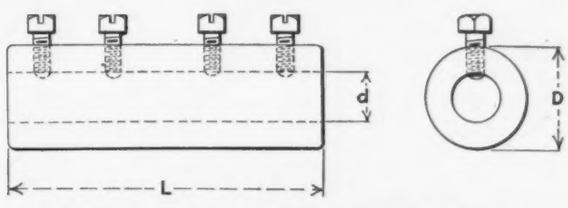


FIG. 4—TUBULAR CONNECTOR FOR CRANE WIRING

Connectors, preferably of the tubular type, should be used for joining crane contact wires to the conductors which bring the energy to the crane runway. Most of the connectors on the market which are used for this purpose are not of sufficiently sturdy construction to withstand the knocks that they receive around the average industrial plant. Fig. 4 shows a detail and

the accompanying table gives the important dimensions for tubular connectors of exceptionally liberal design for crane contact wires. The hollow cylinder forming the body of the connector is a piece of brass or bronze rod having a hole of the diameter indicated in the table drilled through axially. The set screws should be of case-hardened steel and at least ¼ in. in diameter.

Square-headed or hexagonal-headed screws should be used so that they can be turned with a monkey-wrench or a pair of pliers. If screws of this kind that are also slotted across the head, as shown in Fig. 4, can be obtained, they are very convenient, as they can be withdrawn or inserted with either a screwdriver or a monkey-wrench.

Letter to the Editors

Street-Lighting Requirements

To the Editors of the Electrical World:

SIRS:—The writer has before him the report of the street-lighting committee read before the National Electric Light Association at its convention held in Philadelphia in June, 1914. The perusal of this document has led him to make comparisons between the work of that committee and of the joint committee formed in London in 1910 to "draw up a standard specification for street lighting." As a member of the latter committee, the writer is not surprised to note that in America, as in England, finality was not reached, though from a different cause. In the case of the London committee, consisting as it did of members drawn from the Institution of Electrical Engineers, the Institution of Gas Engineers, the Institution of Municipal and County Engineers and the (British) Illuminating Engineering Society, the whole problem was discussed on a broad basis which would be acceptable to all the interests concerned. A draft specification was eventually prepared and published in a paper read by Mr. A. P. Trotter before the (British) Illuminating Engineering Society on April 15, 1913, when the proposed clauses were fully discussed by the members present and the views of many leading men were communicated.

Both in committee and during the discussion of the above paper considerably divergent views were expressed as to the advisability of using minimum horizontal illumination as the basis of a street-lighting specification. This was recommended by the majority of the London committee.

The fact that this basis has not even been mentioned in the National Electric Light Association's report may be accounted for by the poor support a somewhat similar proposal met with when put forward by the 1907 committee in America. But it is, nevertheless, surprising that, even under the photometric tests of horizontal illumination as suggested by the N. E. L. A., no mention is made of the importance of the minimum illumination test.

The N. E. L. A. committee presented certain general recommendations appertaining to street-lighting contracts, one of which is to "prescribe and provide means of establishing the fact that the lighting equipment and service supplied conform to contract and specification." Provided that the selection of the lighting system installed should result in a minimum illumination the non-attainment of which would *ipso facto* condemn the illuminants, the requirements are more concisely stated by specifying this minimum than by any other means.

It appears that the committee thinks otherwise by its first general recommendation, namely, "the specifying and describing of lamps beyond possibility of misunderstanding." This is where the London committee completely differs. The specifying of any particular type of lamp leaves several factors uncared for. For example, the best arc lamp or high-pressure gas lamp will not continue to give good illuminating results if not properly attended to. It is, therefore, in the opinion of the writer, more important that the illuminating results should be guaranteed than the particular design of lamp or light source.

This leads to the chief difference of the two reports, namely, that in the case of the London committee the psychological aspect was not touched on, whereas the N. E. L. A. make it the leading feature. The observation tests, for example, are matters of opinion and not measurement, and yet these tests are placed before the photometric tests. Moreover, the results of these observation tests are very contradictory.

In comparing 400-cp units with 100-cp units the general opinion was in favor of the smaller unit, and yet as a psychological expert Dr. Hugo Munsterberg states that "lamps ought to be strong enough to allow rather large distances." Thus a well-trained psychologist gives an opinion quite different from that conveyed to the mind of the average man; but as the lighting of streets is for the benefit of the public and not of the trained psychologist, the vote of the former must be considered. The production of a hypnoid state by uniform illumination can be easily tested by deciding if one feels more sleepy on a brilliantly sunny day or on a dull day.

As Mr. Trotter stated in his paper, the London committee tested the question of the general effect by delegating municipal and county engineers to inspect and classify a large number of streets illuminated in various manners and degrees. This purely qualitative classification was checked by measurements of minimum illumination, and it was found that the classification agreed exactly, though no less than six classes were chosen. As Mr. Trotter pointed out, this agreement is noteworthy as "it shows that judgment by eye by experienced men is in accordance with careful photometric tests," and further "that the surveyor members seem to have been unconsciously influenced by the minimum illumination in each case, for the maximum illumination shows no sort of agreement."

The freshening of the attentive powers by means of illumination is a point which has not been discussed in this country, but from personal experience the writer would suggest that complete darkness freshens the attentive powers more than anything else. Anybody who has attempted to drive a car on a dark night knows that he requires all his wits about him.

The second of the fundamental purposes to be served by street illumination as laid down by the N. E. L. A. is somewhat difficult to comply with as it would necessitate the lowering of the height of street lamps in order to produce the necessary shadows of surface irregularities. This is more effectively done by the headlamps of vehicles, and in the case of sidewalks by preventing such irregularities by maintaining the quality of the paving.

The valuable work and tests now being carried out by the street-lighting committee of the National Electric Light Association cannot fail to be appreciated by all, and it is difficult to overestimate the usefulness of the report already published. But it is sincerely to be hoped that a further report and final decision will not be delayed by attempting to tread far in the realms of psychology. To draft a street-lighting specification and contract on psychological lines would indeed require the freshening of the attentive powers, and it is doubtful if Sir Oliver Lodge, or even an angel, would care to undertake the task.

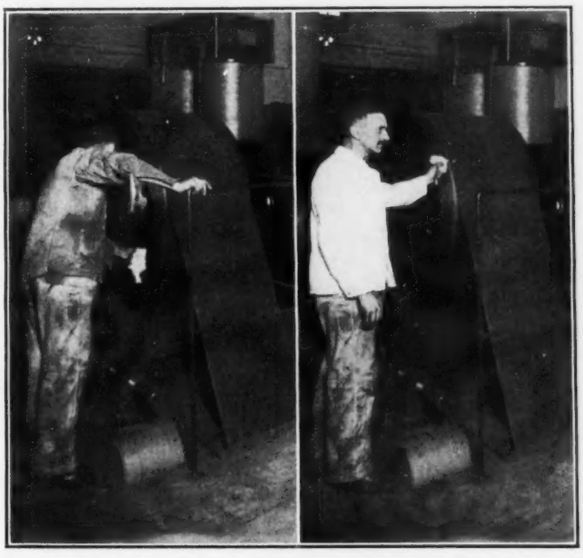
Westminster, London, Eng. HAYDN HARRISON.

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Torn Clothing Menace to Life Around Moving Machinery

Illustrated herewith are the dangerous and safe ways of wiping revolving pulleys. Fig. 1 represents the way in which some men endanger their lives by wearing torn clothes around moving machinery. The loose ends of the clothing may be caught by some projecting stud or similar object and the wearer either injured or killed outright by being drawn into the belt or whipped about the floor. By leaning over the pulley in the way shown in the half-tone a man also runs the risk of falling onto the belt or catching his arm in the spokes of the pulley. Fig. 2 shows the correct way in which to wipe the pulley. The man stands erect, applies the waste to the pulley at the point where the belt leaves it, and has no torn clothing which can be caught in the rotating



FIGS. 1 AND 2—THE UNSAFE AND THE SAFE WAY OF WORKING AROUND MOVING BELT

parts. Photographs similar to these are being displayed in conspicuous places by the Rochester (N. Y.) Railway & Light Company to advise its employees of the right way of working around moving machinery in order to insure the greatest degree of safety.

Necessity of Good Feed Water When Forcing Boilers on Peaks

It is necessary to give greater attention to the condition of the boiler feed water where boilers are to be operated at high steaming rates as injury to the tubes is more liable to occur under this condition, particularly if the water contains scale-making matter. This, of course, is of less importance where surface condensers are used and the percentage of make-up water is small, but in plants where jet condensers are used it may be necessary to provide for treatment of the feed water. According to Mr. B. F. Wood, the usual method of treatment is by caustic soda or soda ash, added while the water is hot, preferably at about 200 deg. Fahr. This system requires a large tank for sedimentation and reduces the scale-making matter to about three or four grains per gal. After this treatment, and before the water is fed into the boilers, dry soluble tannin extract may be introduced which will keep the scale-making matter in solution. The cost for chemicals for this treatment is about 1 cent to 2 cents per 1000 gal. and gives as good results as can be obtained, except by evaporation.

Bleeder Turbines in Combined Manufacturing and Generating Plant

An effective method of apportioning the exhaust steam from the high-pressure stages of bleeder turbines to brine evaporators and the low-pressure stages of the same turbines is employed in a combined salt-manufacturing and electrical generating plant at Runcorn, England. Three 725-kw turbine-driven generators having the high-pressure and low-pressure stages separated by a diaphragm are used to supply electricity to plant pumps and to an electric-service system. When the generators are only partially loaded all of the exhaust steam from the high-pressure casings is utilized to heat the brine evaporators. At higher loads an automatic valve in the exhaust pipes allows the excess steam to flow through the low-pressure stages of the same turbines and thence to the condensers. By this arrangement all of the steam is used to the best advantage. The position of each steam-distributing valve is determined by the pressure in the main leading to the evaporators. If steam in excess of the amount required by the brine evaporators is discharged into the main, the pressure will rise, causing the steam-distributing valve to open ports feeding the low-pressure stages of the turbine.

Two Transformers in Three-Phase Circuit

What effect on the voltage regulation has the operation of two transformers in V-connection in a three-phase system? E. A.

When two transformers are V-connected for carrying a three-phase load the voltage under load must become somewhat unbalanced on account of the impedance of the transformer circuits. If the middle point of both the primary circuit and the secondary circuit of one of the transformers can be reached in one of the transformers, a very much more advantageous arrangement is to T-connect the circuits. Two transformers which can be V-connected to carry a certain load will carry the same load at a higher efficiency and with less voltage distortion when T-connected. It is worthy of note that the prime requisite for T-connection on transformers for three-phase work is met when the two transformers possess the same ratio of primary to secondary turns and a tap is brought out of the central point of one of the transformers.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

Direct-Current Motor and Generator Diagrams.—R. H. Taber.—Any one change in the operation of a direct-current machine of necessity brings about changes in dependent or related characteristics. Although a first consideration of their relations would indicate a hopeless number of permutations of conditions in the machine circuit, it will be found on closer analysis that they can be reduced to a few simple groups covering practically the complete range of direct-current operation. In this article certain sets of conditions are selected as working standards, and on that basis a thorough study is made of the direct-current machine, the results being given for reference in tabular form, together with the corresponding diagrams of connections. These data are intended to serve in practice exactly the same function as a formula for common use the more or less complicated derivation of which is not necessary in its every application.—*Elec. Journal*, September, 1914.

Lamps and Lighting

Tungsten Lamps.—A note on a recent British patent (No. 18,447, 1913) of the British Thomson-Houston Company and the General Electric Company of this country for a device for increasing the useful life and maintaining the initial efficiency of tungsten-filament lamps. A small quantity of potassium thallium chloride is contained in a small open tube inside the bulb. Before the latter is sealed a small quantity of pure dry nitrogen is admitted at a pressure of from 10 to 50 microns.—London *Elec. Eng'ing*, Sept. 3, 1914.

Half-Watt Tungsten Lamps.—H. Lux.—An illustrated English translation in abstract of his recent German paper which has already been noticed in the Digest. —London *Electrician*, Aug. 21, 1914.

Generation, Transmission and Distribution

Protection of Electric Installations Against Traveling Waves.—Fritz Fröhlich.—The trouble of protecting installations against dangerously high voltages produced by traveling waves is not due to a lack of suitable apparatus which can carry the charges off to earth (because such apparatus is available), but to the difficulty of determining the correct point at which to place the apparatus. This problem is solved by Pizzuti and

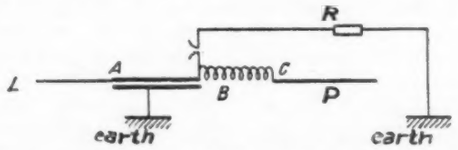


FIG. 1—DIAGRAM OF PROTECTIVE ARRANGEMENT

Ferrari by means of an arrangement which always produces a node (maximum) of the oscillation at a distinct point so that any suitable discharge apparatus (lightning arresters, etc.) connected to that point will surely carry off the charge to earth. The principle of the Pizzuti-Ferrari system is shown in Fig. 1, in which *AB* represents a condenser, one plate of which is in series with the line *L* and is inserted between the line *L* and the installation *P* to be protected. The other condenser plate is directly connected with earth. Between the first condenser plate and the installation *P* an inductance coil *BC* is inserted. In this way two sections *AB* and *BC* are placed between *L* and *P*, and for the section *AB* the value of the square root of the ratio of

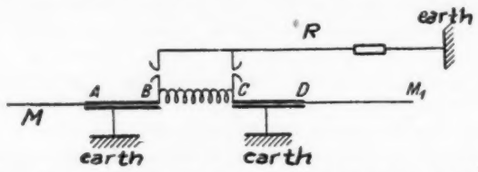


FIG 2—DIAGRAM OF PROTECTIVE ARRANGEMENT

self-induction to capacity is very low, while it is very high for the other section, *BC*. Any oscillating wave which comes from the line *L* will therefore be totally reflected at the point *B*, and in this point an oscillation node will be produced, so that if a lightning arrester is connected to this point the charge is carried off to earth. The energy of the oscillation wave is not only carried off to earth through the lightning arrester but also through the dielectrics of the condenser *AB*. The same principle may be used to procure protection against rises of voltages which can occur at both ends of a line, as in long transmission lines, or against rises of voltages which can occur in the installation itself as a result of the melting of fuses, the disconnection of circuit-breakers, etc. In this case the arrangement of Fig. 2 is used. Any oscillation wave coming from *M* is reflected in *B;* any oscillation wave coming from M_1 is reflected in *C*. About 100 Pizzuti-Ferrari machines are in use in various Italian transmission systems.—*Elek. Zeit.*, Aug. 13, 1914.

Alternator Short-Circuits.—Cassius M. Davis.—The author gives a description of the "mechanism" of alternator short-circuits, which is accompanied with diagrams. The phenomena attending the building up of the armature current under a short-circuit are analyzed in detail and the behavior of the armature voltage is described. The attendant changes in both the field current and the field voltage are cited, and Helmholtz's law, as applied to the growth and decay of currents when a short-circuit occurs, is stated. Tests of various alternators are given which show that the theoretical calculations correspond closely to the observed facts.—*Gen. Elec. Rev.*, August, 1914.

Traction

German Mountain Railway.—An illustrated description of the mountain railway on the Wendelstein in Bavaria, which is the first direct-current line in Germany operated at 1500 volts. While it is a small road, it is interesting because a storage battery is provided for recuperation of energy.—*Elek Zeit.*, Aug. 6, 1914.

Paris.—T. Pausert.—An article on the electrification of the tramway network of the General Omnibus Company, of Paris, with a series of illustrations of the different omnibuses used by this company during the last sixty years.—*La Revue Elec.*, Aug. 7, 1914.

Train Heating.—RAY STEARNS.—There are two general types of devices used for train heating, namely, fuel-burning heaters and electric heaters. The author gives an illustrated description of two typical examples of each kind, namely, the flash boiler used by the Pennsylvania Railroad for its New York Terminal electrification and the 30-kw electric hot-air heaters used on the Butte, Anaconda & Pacific Railway for heating its passenger coaches in an all-electric zone.—*Gen. Elec. Rev.*, September, 1914.

Installations, Systems and Appliances

Earthing.—The Allgemeine Elektricitäts Gesellschaft has addressed a memoir to the German Association of Electrical Engineers pointing out that there is a great variety in the regulations concerning grounding in force in different plants. It is proposed that the association should bring uniformity into these regulations and should investigate especially the following three points: First, the grounding ("Erdung," "mise à la terre") of the neutral conductor; second, the connection of the metallic portions of the apparatus with the grounded neutral conductor ("Nullung," "mise au neutre"), and third, all other protective devices such as the employment of insulation, etc. In the memoir a summary is given of accidents along these lines and, further, a review of the different regulations in force in numerous German plants. Finally the possibilities are discussed of the protection which can be attained by grounding the neutral conductor, and the liabilities of danger are pointed out. The method of grounding is also discussed with reference to the possibility of a contact between high-tension and low-tension circuits.—*La Revue Elec.*, Aug. 7, 1914.

Starting Rotary Converters.—A note on a recent British patent (No. 8711, 1913) of the Siemens Brothers Dynamo Works, Ltd., and the Siemens-Schuckert company. When rotary converters are started up from the alternating-current side the polarity at the moment the machine comes to synchronism is a matter of chance, so that a reversing switch has to be provided in the field circuit. This invention insures correct polarity by the use of an electrical valve in the exciting circuit, which valve allows current to flow in only one direction. It may consist of an iron-aluminum cell and is connected in series with a regulating rheostat and the field winding of the converter. A high resistance should be arranged in parallel with the cell to guard against an excess of pressure.—London *Elec. Eng'ing*, Aug. 27, 1914.

Protection Against Accidents.—VOGEL.—Some notes on the experiences had in the Upper Silesian industrial district with respect to electrical accidents. The author deals with the protection against contact with machines, apparatus and measuring instruments, with the use of electric hand machines and hand apparatus, with electric accidents caused by electric locomotives in underground mines, with dangers and protection in connection with high-tension switchboards, with accidents in closed high-tension rooms, and with the space requirements of electrical equipments.—*Elek. Kraft. u. Bahnen*, Aug. 4, 1914.

Wires, Wiring and Conduits

Computation of Composite Alternating-Current Lines.—A. E. KENNELLY.—A composite line is defined as one consisting of a plurality of successive sections, each having its own uniform electric constants. In the present article the author shows how conveniently and swiftly the electrical characteristics of a composite alternating-current line can be computed by means of tables and charts of hyperbolic functions. No familiarity with the mathematical theory of hyperbolic functions is required but only a moderate acquaintance with the working formulas of ordinary circular trigonometry.—*Journal* Franklin Institute, September, 1914.

Electrophysics and Magnetism

Ratio of Charge to Mass of Electrons.—SAUL DUSHMAN.—In a recent paper on the effect of space charge and residual gases on thermionic currents in high vacuum, I. Langmuir has shown that the thermionic current from a heated metallic surface in a high vacuum is limited by temperature and space charge. The space charge formula developed by him for the thermionic current from a heated filament to a coaxial cylindrical anode was tested by the present author experimentally over a range of voltages from 35 to 140, for the case of a tungsten filament in a concentric molybdenum cylinder. The results obtained are in good agreement with this formula and indicate that the method ought to prove a very accurate one for the determination of e/m. The observations obtained on the effect of gases on the thermionic currents are also found to be in accord with Langmuir's surface-film theory and justify the conclusion that there exists a pure electron emission from heated metals which is a function of the temperature only and is not a secondary effect due to presence of gases as assumed by a large number of investigators.—*Phys. Rev.*, August, 1914.

Spectra.—A paper by W. M. Watts deals with the spectra given by carbon and some of its compounds, and, in particular, the "Swan" spectrum. A paper by W. M. Hicks deals with high-frequency spectra and the periodic table, and a paper by J. R. Rydberg with the ordinals of the elements and the high-frequency spectra. In a paper by J. W. Nicholson it is pointed out that the crucial test of Bohr's theory of spectra is to be found in its application to the ordinary spectrum of helium. The author's mathematical analysis seems to indicate that Bohr's theory is incapable of further developments in the interpretation of spectra.—*Philos. Mag.*, July, 1914.

Current Between a Wire and a Coaxial Cylinder.—JOHN S. TOWNSEND.—An experimental investigation of the potential required to maintain a current between a wire and a large coaxial cylinder when a glow discharge is produced by a high electric force. The author determined the velocities of the positive ions and the negative ions under unit electrostatic force.—*Philos. Mag.*, July, 1914.

Osmosis.—F. T. TROUTON.—His address to Section A of the British Association at the recent meeting in Australia on the phenomena of absorption and adsorption and their relations to osmosis.—London *Electrician*, Aug. 28, 1914.

Large Electromagnets.—MAURICE LEBLANC, JR.—For laboratory purposes the production of very intense magnetic fields is often important. A simple means is to use electromagnets with an almost closed magnetic field and to make the experiments within the small air-gap. The author discusses the different solutions of the problems which have been proposed by Weiss, Perrin, Deslandres, Fabry, Perrot, Cotton and Piccard.—*La Lumière Elec.*, July 11, 1914.

Electrochemistry and Batteries

Electric Steel.—IVAR RENNERFELT.—An article on the electric arc furnace and the development of the steel casting industry. The author replies to the recent article of G. Muntz in favor of the Tropenas converter and endeavors to show that this is inferior to the electric-arc furnace for foundry uses.—*Met. and Chem. Eng'ing*, September, 1914.

Primary Battery.—In the usual primary batteries soluble salts are formed by solution of the anode, and these salts participate in the electrolysis. For instance,

in the ordinary voltaic cell zinc sulphate is formed and participates in electrolysis and zinc ions gradually travel over toward the copper electrode. The author proposes to use an anode of such a chemical nature that the salt which is formed by the reaction of the anode with the electrolyte is insoluble. He uses as anode a lead amalgam (90 lead to 10 mercury) and a carbon cathode with a solution of sulphuric acid and nitric acid as electrolyte (80 cu. cm sulphuric acid at 66 deg. Baumé and 120 cu. cm nitric acid at 36 deg. Baumé in 1000 cu. cm water). The cell is stated to have a rather constant emf.—*La Lumière Elec.*, July 25, 1914.

Telegraphy, Telephony and Signals

Application of Telephone Relays to Commercial Circuits.—C. Robinson and R. M. Chamney.—Details are given of a balanced telephone relay system, including a device for automatically cutting out the relay in event of a fault occurring which would upset the balance of the line. Methods employed for signaling are also given.—London *Electrician*, Aug. 14, 1914.

Wireless Telegraphy.—H. Rein.—The author discusses whether wireless-telegraph stations should be operated with damped or undamped oscillations. That is, whether they should be operated by a spark system or by high-frequency machines. In favor of the spark system (damped oscillation) there is only one fact, namely, the ease with which the wave-lengths can be varied quickly and continuously over a wide range. As in most large wireless stations it is sufficient to generate one or only a few different wave-lengths, this advantage of the spark system is not decisive. With respect to the efficiency on the sending end, or the energy absorption in the ground and in the atmosphere, or the possibility of using a sound receiver, there is no essential difference between stations using damped or undamped oscillations. With respect to all other important points the comparison is in favor of undamped oscillations (high-frequency machines). With the latter, generation of the largest amounts of oscillation energy is possible without any fundamental difficulty. At the same time the transmitting antenna is utilized to the fullest extent. Moreover, the energy absorption of the receiving indicator is always greater with undamped oscillations than with damped ones. Finally, stations with high-frequency machines do not disturb adjoining installations using spark systems in their mutual intercourse.—*Elek. Zeit.*, July 30, 1914.

Book Reviews

High and Low Tension Switchgear Design. By A. G. Collis. New York: D. Van Nostrand Company. 220 pages, 94 illus. Price, $3.50.

The title of this book suggests that it deals exclusively with the design of switchgear; but it actually covers a wide range of subjects, and its interest lies less in its treatment of switchgear details (there are but few cuts or descriptions that might interest the designer) than in its more subtle and elusory qualities which cannot readily be apprehended. Perhaps the preface supplies the key to the choice of title, in suggesting the probable appearance of further publications, presumably by the same author, on the same subject. We are told that "The major portion of this contribution is expressly intended as an introduction to the main elements of design, which will be more abstracted by further publications on the individual subjects involved." The book is divided into two parts—alternating-current switchgear and direct-current switchgear—but the topics touched upon under the two headings are of a miscellaneous nature, and the complete lack of logical sequence in the presentation of the material puts serious difficulties in the way of any reader wishing to refer to particular passages. This contingency has obviously not been anticipated by the author, because he has not taken the trouble to provide an index. The best feature of the book is the introduction of oscillograph records of circuit-breakers opening under various load conditions. These are well reproduced, and they speak for themselves. The author's language is peculiar. He appears, not infrequently, to be influenced in his choice of words rather by their sound values than their sense values, as for instance when he tells us that "the expansion of a fuse element to its vaporized form is 2000 times its normal," and that "it is in default of a proper understanding of the effects of power-factor that competition has covered up its technical points." The author appears to be familiar with British practice in the matter of switchboard arrangements, but his book is no evidence of his experience as a designer of switchgear, and it is not entirely clear why he has chosen to write on this particular theme. The most characteristic parts of the book are, perhaps, the preface and the concluding paragraphs. The closing sentence, which is particularly impressive because of its euphonic perfection, is worth quoting: "Every new experience opens up another field of research, until it is found that the more information is acquired the more information is needed, and the conclusion is forced upon one that the human element is by far the most infinite son of the industry with its failure more pronounced." This statement is indisputable; but is it not equally true that the less knowledge one has the greater the reason for imparting it to others, and that the least infinitesimal daughter of the industry is invariably an unpronounceable success?

Switches and Switchgear. By Prof. R. Edler. Translated by Ph. Laubach. New York: D. Van Nostrand Compaany. 402 pages, 365 illus. Price, $4.

It would seem that the subject of switchgear offers fewer attractions to writers of technical books than almost any other phase of electrical engineering, and this book by Professor Edler, ably translated and slightly modified by Mr. Laubach, is, as claimed in the preface, the first English work which "combines a theoretical treatment of the subject with a comprehensive series of practical examples in design." The first book in the English language treating exclusively of switchgear, and laying stress on the heavier designs used in generating stations, was written many years ago by Mr. Leonard Andrews, a prominent British electrical engineer, and it is probable that the gentleman laconically referred to as "Andrews" on page 134 of the book under review is the author of the earlier book. This, however, does not invalidate the claim made by Mr. Laubach that no specialized comprehensive literature on the subject of switchgear has up to the present time been available, because the book by Mr. Andrews does not pretend to go into details of design or fundamental theories. Professor Edler's book, if not the only one available on the subject, is unquestionably the best and most comprehensive, and it deserves to be widely read by those interested in the subject. The very fact that the Continental and British types of switchgear are mainly dealt with should prove of special interest to the American engineer, who cannot afford to neglect the study of foreign engineering practice. One of the best chapters in the book deals with the theory and design of starting and regulating resistors and controllers. Methods of calculating feeder regulators designed on the principle of cutting out resistance as the load increases are explained, but the less wasteful induction type of regulator, connected as a "booster" on alternating-current feeders, is not mentioned.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Recording Telephone Conversation

Shortly after his invention of the phonograph in 1878, Mr. Thomas A. Edison predicted that this instrument would help to perfect the telephone. "In writing our agreements," he asserted at that time, "we incorporate in the writing the summing up of our understanding—using entirely new and different phraseology from that which we used to express our understanding of the transaction in its discussion and not infrequently thus begetting perfectly innocent cause of misunderstanding. Now, if the telephone with the phonograph to record its sayings were used in the preliminary discussion, we should not only have the full and correct text but every word of the whole matter capable of throwing light upon the subject." Recently this prediction was verified when Edison himself developed an apparatus, comprising a dictating machine equipped with telephone-recording devices, which he has named the "telescribe."

The dictating machine is equipped with a micro-recorder which swivels into place over the wax cylinder and is wired to a telephone extension operated with its own small batteries. The latter is mounted on the user's desk. A telephone message is recorded in the following manner: The receiver of the regular desk telephone is removed from the hook and placed in the socket provided with the recording apparatus. In this way the acoustic connection to the dictating machine is made without danger of criticism from the telephone company, as the instrument is neither mechanically nor electrically connected to its lines. The user then takes up a small receiver and gives his call to the exchange, while starting and stopping the dictating machine by means of two small buttons in order to record the conversation between pauses or delays, thus avoiding any waste of the cylinder. In this way both sides of the telephone conversation are recorded, as well as that of the central operator in making the connection. Mr. Edison is shown in the accompanying illustration at his desk using the "telescribe."

Electrically Operated Clam-Shell Bucket

The clam-shell bucket illustrated herewith is designed for use with almost any hoisting machine with one or more hoisting drums, as it is only necessary for the operating machine to raise and lower the bucket, the digging and discharging of the load being accomplished by means of a motor and drum in the head of the bucket. This bucket is used on cranes in foundries and shops for digging and rehandling materials for which a clam-shell bucket is suited. All movable parts of the motor are inclosed in a heavy casing. Energy is conducted to the bucket by a small waterproof cable. The bucket is operated by means of a rheostat for two to four speeds each way. An automatic cable take-up reel, which may be placed in any

MR. EDISON TESTING HIS NEW INVENTION, THE "TELESCRIBE"

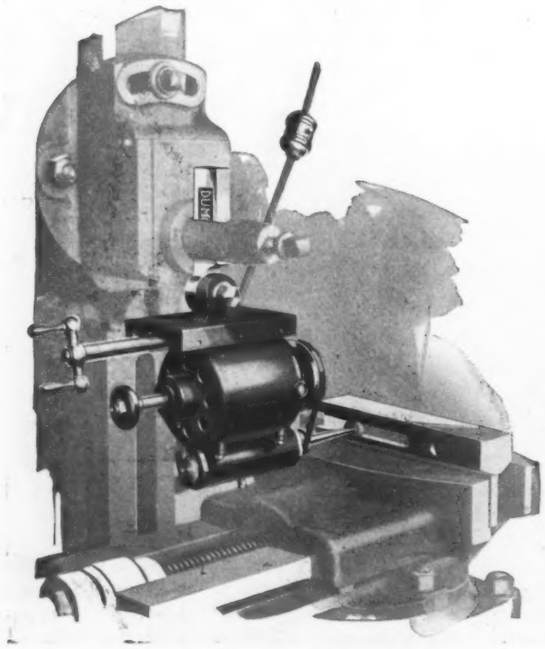
CLAM-SHELL BUCKET WITH MOTOR AND DRUM

convenient position, is provided for varying the tension on the cable.

This bucket is being placed on the market by the Hayward Company, 50 Church Street, New York.

Portable Electric Tool-Post Grinder

A small motor-driven machine designed for center grinding, cylindrical grinding, close internal work and lapping out dies was recently brought out by the Wisconsin Electric Company, Racine, Wis. A 0.25-hp motor operating on both alternating current and direct current at a speed of 10,000 r.p.m. is used to drive this grinder. Connected to the main spindle by a rubber belt is another spindle which runs at a speed of 30,000 r.p.m. The complete apparatus weighs 17.5 lb.



ONE METHOD OF USING GRINDER

Socket for High-Candle-Power Lamps

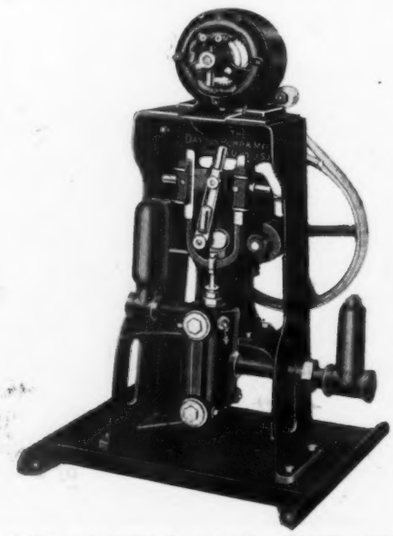
Owing to the advent of nitrogen-filled tungsten lamps, which take 1000 watts or more, the tendency of the illuminating engineer is to replace clusters and other lighting groups with a single unit. As a result of this movement it has been necessary to improve the auxiliary

SOCKET FOR NITROGEN-FILLED INCANDESCENT LAMP

equipment. This has been particularly the case with sockets and receptacles. In the accompanying illustration is shown a mogul socket, as it is called, manufactured by the Bryant Electric Company, Bridgeport, Conn., for use with high-candle-power incandescent lamps. It is larger in size and is built for more severe usage than the ordinary sockets. The live parts of this socket are sealed in with a compound, which, the manufacturers declare, will not soften at any temperature to which it may be subjected when in service.

Electric Pump for Short Lifts

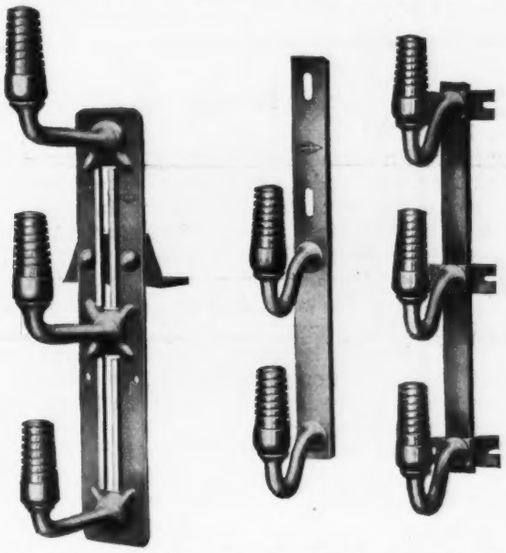
An electric pump for pumping from shallow wells, lakes, cisterns or for any suction lift up to 22 ft. is shown herewith. This pump has a rating of 275 gal. per hour against a pressure of 50 lb. per sq. in. and will pump water to an elevation of 110 ft. The pump is belted to a 0.25-hp motor, which is mounted above the pump on a cast-iron frame. The pump is double-acting and is fitted with an automatic air intake valve for pressure-tank service. The Dayton Pump & Manufacturing Company, Dayton, Ohio, makes this pump.



MOTOR-DRIVEN PUMP FOR SHORT LIFTS

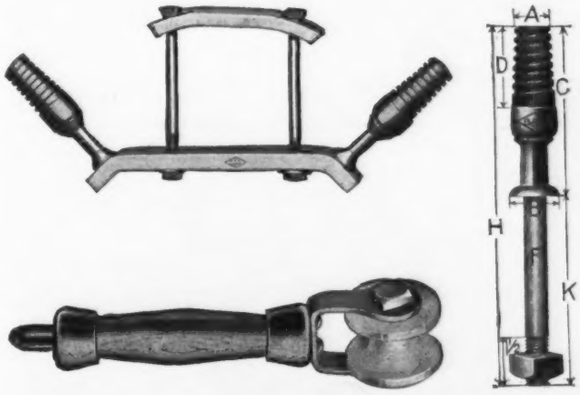
Pole-Line Hardware

A number of devices for use in connection with pole lines have recently been developed by the Barnes & Kobert Manufacturing Company, Milldale, Conn. In Fig. 1 is shown a wide back plate with a center slot for attaching to a wall or cross-arm. In the latter case the



FIGS. 1, 2 AND 3—BACK PLATE, TWO-POINT SERVICE BRACKET AND THREE-POINT WALL BRACKET

plate is clamped to the arm, the ends of the clamp projecting through the center slot. Fig. 2 shows a two-point service bracket and Fig. 3 a three-point wall bracket. The break arm shown in Fig. 4 is used in taking off wires below the cross-arm. The long pin illustrated in Fig. 5 is of the Western Union type and is made either ½ in. or ⅝ in. in diameter. The wood



FIGS. 4, 5 AND 6—BREAK ARM, LONG PIN AND WOOD STRAIN INSULATOR

strain insulator shown in Fig. 6 is equipped with heavy drawn-steel caps and is made of impregnated second-growth hickory. The spool may be either of porcelain or composition.

Electrically Driven Washer with Safety Attachments

An electric washer of the wooden-tub type driven by a 1/5-hp motor is now being introduced by the Meadows Manufacturing Company, Pontiac, Ill. Power is transmitted from the motor to a jack-shaft through a round belt, and it is possible to operate the washer and the wringer either separately or simultaneously from the jack-shaft through combination shaft and chain drives. The washer complete weighs 225 lb., and when not in use it can be stored in a 22-in. by 22-in. space.

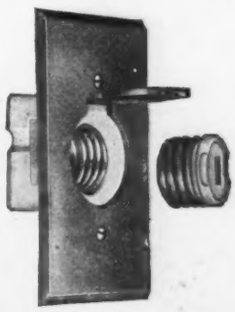
The interior mechanism of the machine has been arranged so that with the motor running the washer

MOTOR-DRIVEN WASHER WITH SAFETY ATTACHMENTS FOR WOODEN TUBS

is placed in operation by lowering the lid, action ceasing when the cover is raised. To start the wringer, pressure must be applied to the foot pedal, and releasing this pedal stops the wringer. This feature, the manufacturer claims, provides greater safety, as a person operating the machine would involuntarily remove the foot from the pedal in an emergency. A hand lever near the wringer makes it easily reversible.

Device for Adapting Screw Receptacle to Push Plugs

In order to convert screw-base flush receptacles into the more convenient "push-in" type, a device called an "adapter" has been developed. The device is screwed into the receptacle and is then left in. It is small enough so that the lid will close. The device is equipped



DEVICE FOR CONVERTING SCREW RECEPTACLE TO PUSH-IN RECEPTACLE

with phosphor-bronze contact springs similar to those used in the ordinary base of separable attachment plugs. This device is being made by the H. T. Paiste Company, Philadelphia, Pa., for which the Hart & Hegeman Manufacturing Company, Hartford, Conn., is sole selling agent.

Table for Electrically Operated Sewing Machines

A convertible table designed for motor-driven sewing machines is shown herewith. When not in operation the machine can be dropped out of sight, and then the table

CONVERTIBLE TABLE FOR ELECTRIC SEWING MACHINE

may serve any of the numerous purposes for which an ordinary small table in the home is employed. The small motor is controlled by the foot pedal shown in the illustration; when not in use it can be placed in the body of the table. The table is made either of oak, birch or mahogany. The motor can be fitted, the manufacturers declare, on any sewing-machine head. The table and the motor used in the operation of the machine are the product of the Bissell Motor Company, Toledo, Ohio.

Outside Location for Meter

In the accompanying illustration is shown a method of conveniently housing a meter whereby a reading can be taken without annoying the occupants of the house. The meter is set face outward in the exterior wall of the building. The box is fireproof and is equipped with a glazed window and a door which can be securely locked. This box, the manufacturers claim, covers all the requirements of public-service companies and is provided with all the necessary outlets and connections for wires, etc. This box is the product of the Donley Brothers Company, Cleveland, Ohio.

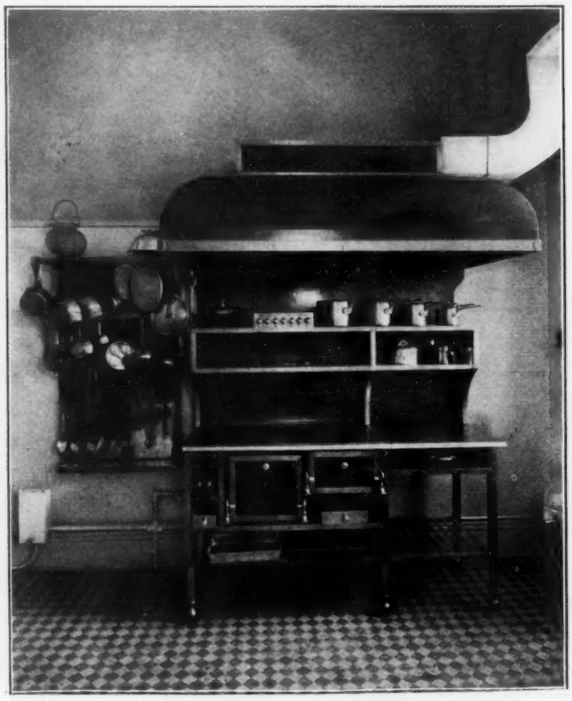
METER IN EXTERIOR WALL

Electric Hotel Range

The large-sized electric range shown herewith is equipped with a surface heater, an upright broiler compartment, an oven and a salamander. The heating elements are of the exposed type and are insulated with porcelain. The surface cooking is controlled by two switches, the current with one being 8 amp and the other 10 amp. The salamander heater is similarly controlled, the current being 7 amp and 8 amp. The oven heater takes 12 amp and is controlled by two switches, the current with each being 6 amp. The upright broiler takes 16 amp; it has only one heat, which is maximum. This broiler is so arranged that food can be broiled on both sides simultaneously.

All the switches are of the indicating single-push-button type and are equipped with pilot lamps. Fuses are placed immediately behind the switches. The body of the range is of sheet steel, the facings of Russia iron, the top of semi-cast-steel and the legs of nickel-plated cast iron. The trim is of monel metal and German silver. The top of the range is 42.5 in. by 24.5 in. and the range is 36 in. high. The oven is 14 in. by 16.75 in. by 12 in.; the salamander is 13.75 in. by 16 in. by 7.5 in., and the broiler compartment is 11 in. by 3 in. by 9.5 in. The outside cooking surface is 16 in. by 32 in. The hood may be connected to a ventilating system for removing the cooking fumes. Features in connection with this range are the shelving space above the surface heater and the table attached to the range.

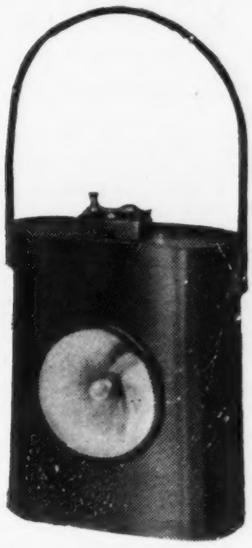
This "Biltmore" range, as it is called, is being manufactured by Wells, Mowbray & Newman, Inc., 125 West Forty-second Street, New York.



ELECTRIC RANGE FOR HOTELS AND RESTAURANTS

Electric Lantern

An electric lantern operating with standard-sized dry cells has recently been developed by the H. W. Johns-Manville Company, New York. With two dry cells used

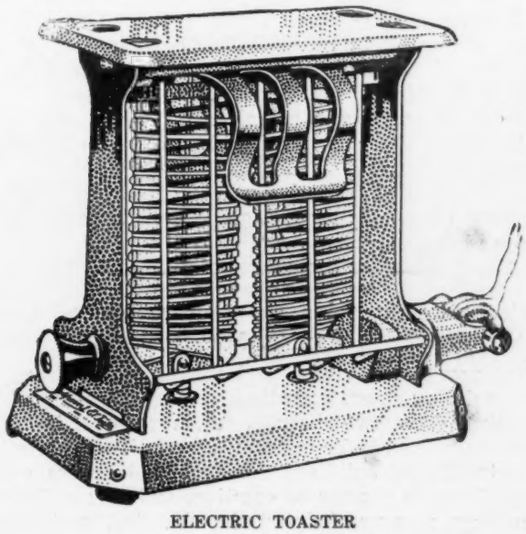


ELECTRIC LANTERN OPERATED WITH STANDARD DRY CELLS

intermittently, the manufacturers claim that the lamp will operate for a total of 150 hours. The lantern is equipped with a small tungsten lamp and a parabolic reflector. With the light produced it is declared that objects 150 ft. away are clearly discernible.

Vertical-Rack Electric Toaster

The electric toaster shown herewith is equipped with clamps for holding the slices in place. In removing the toast one hand only is necessary as the clamp can be raised with the edge of the slice of bread. This device takes 450 watts, and will, the manufacturers assert, toast two slices of bread on both sides in two and one-

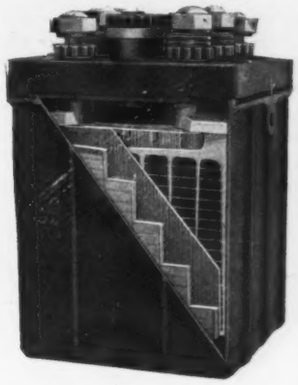


ELECTRIC TOASTER

half minutes or ten slices on both sides in twelve and one-half minutes. Fiber feet are provided which do not scratch the tops of tables. This electric toaster is being made by the Hotpoint Electric Heating Company, Ontario, Cal.

Battery for Motorcycle Service

A small storage battery with a high capacity per unit of weight and volume designed for motorcycle service is shown in the annexed illustration. The elements are contained in a one-piece, three-compartment vulcanite case with heavy walls reinforced by exterior ribs. The case is provided with recessed bosses to receive the ends of a spring bail handle. The battery is closed at the top by a one-piece cover with an outer flange which incloses the supports and protects the top edge of the case, and by three inner sealing flanges



MOTORCYCLE BATTERY

which effectually seal the individual compartments. The gas vent and filling plug contains an expansion chamber to allow condensation of spray, and it is designed so that in combination with the cover the amount of water which can be put into the cells is limited to that needed to replace the water lost by evaporation.

This "Exide type Z" battery, as it is called, is being manufactured by the Electric Storage Battery Company, Philadelphia, Pa.

Reverse Motor Plug

A reverse motor plug with strain-relief bushing is being made by Harvey Hubbell, Inc., Bridgeport, Conn. The device is of tough heat-resisting composition and is designed for use on vacuum cleaners, automatic pianos, advertising apparatus, etc. The contact springs and blades are fastened to small square brass bushings molded into the composition, and the blades are held in position by a recess into which the base of the blade is fitted. The strain bushing is threaded and engages

REVERSE MOTOR PLUG

with a threaded portion of the top of the plug. The base is slotted for wiring. Screw holes for attaching the base to the apparatus are spaced on 1 29/32-in. centers. The diameter of the base is 2.25 in., and the height over all is 2.75 in.

Jobber, Dealer and Contractor

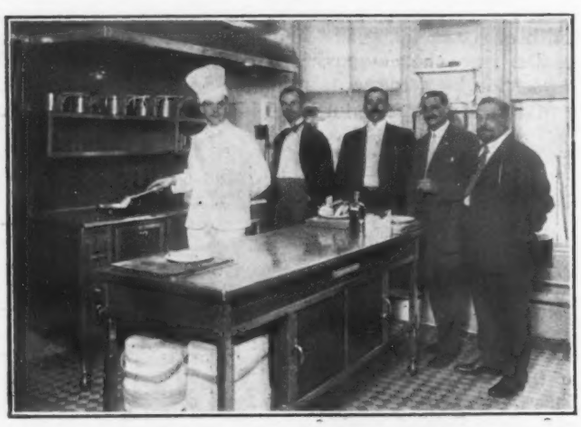
Public Policy for Electrical Contractors

To what extent the electrical contractor can aid himself by the cultivation of tact and friendship among other contractors was pointed out by Mr. A. R. Jones before a recent meeting of Massachusetts contractors. Mr. Jones also advocated training the worker to better performance through the power of the union organization. The speaker told his hearers to seek to obtain the confidence of their men, utilizing their voting power in legislative matters. Direct labor costs more than specialized labor. The elimination of poor work by reinspection was favored. Cheap contractors can be discouraged to some degree by having one's jobber watch his credit and material purchases and by watching for violations of the specifications. Lists of lost orders, records of good employees, fighting against fires assumed to be of electrical origin and strong organization are important factors in furthering the industry. The speaker commended the Baltimore (Md.) license law with the exception of the thousand-dollar bond requirement and advocated taking a leaf from the book of the plumbing trade in laying down policies.

Electric-Cooking Demonstration for Prominent Head Chefs

In the model electric kitchen which is included in the salesrooms of Wells, Mowbray & Newman, Inc., 125 West Forty-second Street, New York, the advantages of cooking by electricity were recently pointed out to a number of New York head chefs. In the accompanying illustration is shown a part of this kitchen, with the men who witnessed the demonstration, including the head chefs from Sherry's, the Hotel Ansonia, the Hotel Biltmore and the Hotel McAlpin.

The electric apparatus in the kitchen consists of a range, a cook's table with plate warmer, water heater, dishwasher and refrigerator. Although the space occupied is comparatively small, everything is compactly arranged. The cook's table serves as a sort of counter between the cook and the butler. The range is at his



MODEL ELECTRIC KITCHEN WITH NEW YORK CHEFS WITNESSING DEMONSTRATION

back, the water heater at his left and the refrigerator at his right. Among the interesting features brought out in the above demonstration was the broiling of a chicken simultaneously on both sides in a special compartment, the operation being completed in less than six minutes.

Checking the Storeroom Balance

The following method of checking the amount of stock on hand may be employed by jobbers, dealers and contractors who maintain a storeroom. Each day a form like the one shown herewith is filled in by the balance-of-stores clerk with a list of the materials to be inventoried. The clerk to whom this duty is assigned makes an actual count of the material in each bin and records the data with the corresponding quantities of stock on hand and the numbers of the last orders filled as shown by the bin cards. By keeping the numbers of the last orders filled from each bin the balance-of-stores clerk is able to tell what period is covered by the inventory without having to suspend the issuing of stock as is done in some plants at the present time. If the actual balance is below the ledger balance, the balance-of-stores clerk should make his entry in red ink to attract attention to the shortage. The bin cards should be made to agree with actual conditions when making an inventory, but changes should be noted on the check-balance sheet.

The system described above is that used by the Portland (Ore.) Railway, Light & Power Company.

CHECK BALANCE SHEET

Mr.....

I have to-day counted the following materials in stores and have corrected the tags and balance sheets where necessary. NOTE.—When actual balance is below ledger balance B. of S. clerk will make his entry in red ink.

SYMBOL	DESCRIPTION	QUANTITY			REMARKS
		ACTUAL COUNT	FIGURES ON TAGS	FIGURES ON BALANCE SHEET	

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

No Shortage in Aluminum.—The British Aluminium Company, of London, England, is finding no difficulty making shipments of aluminum both to this country and Canada. It is maintaining large stocks of the metal both at New York and at Toronto.

Orders for Generating Equipment.—Several noteworthy orders for large generating units were recently received by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa. These include the following: The Erie County Electric Company, Erie, Pa., a 1000-hp steam turbine; the Union Sulphur Company, Sulphur, La., a 500-hp steam turbine; the Laclede Gas Company, St. Louis, Mo., two 250-hp steam turbines; the Wakefield Iron Company, Wakefield, Mich., a complete stoker equipment for a 1000-hp boiler plant, and the Sarnia Gas & Electric Company, Sarnia, Ont., a complete condenser equipment.

Tungsten Deposits in the United States.—According to the United States Geological Survey, the tungsten resources of this country are probably larger than has generally been realized. Many new deposits have been discovered in various parts of the Western States, and should prices advance it is likely that the output could soon be increased to much above that of the record year of 1910, when 1821 tons were marketed. Most of these new discoveries are not sufficiently developed to show how large an output can be expected from them, but it is probable that some will prove to be of considerable extent, and one or two large producers would make a noticeable difference in the American market.

Removing Scale from Boilers.—The Perolin Company of America, Chicago, Ill., has introduced a method of removing scale from boilers called the "Pyro-Perolin" process. Certain gases are ignited and the flame is applied to the scale, which has previously been treated with "perolin" boiler compound, as it is called, whereby the scale is said to be disintegrated. After the boilers are cleaned a liquid heat-conducting film is applied which fills the pores of the metal and to which the scale does not adhere. This film is maintained, the manufacturers claim, by a small daily feed of the boiler compound referred to above. This "perolin" compound was originally discovered in Germany. It has an intense affinity for the heated metal and tends to work between the scale and the metal, thus breaking the bond of adhesion between the former and the latter.

Orders for Turbine-Driven Pumps.—The De Laval Steam Turbine Company, Trenton, N. J., recently received from the city of Philadelphia an order for two turbine-driven geared centrifugal pumps to operate at 2,000,000 gal. a day against a head of 330 ft. The company has also received an order from the city of Toronto for two 24,000,000-gal. pumps to operate against a head of 268 ft.; which will be an addition to the following pumping equipment purchased several months ago: One 15,000,000-gal. pump for a 260-ft. head, one 20,000,000-gal. pump for a 106-ft. head and one 7,500,000-gal. pump for a 266-ft. head. Another order has been obtained by the company from the San Antonio Water Supply Company, San Antonio, Tex., for two 6,500,000-gal. pumps for a 273-ft. head. Installations of this company's pumps have also been made by the city of Cleveland, the city of Omaha and the city of Lynn, Mass.

Refrigeration Plant for New Washington Market.—In the new Washington Market on West Street, New York, now nearing completion, there will be over a hundred stalls, and each stall will have a box cooled by a brine supply delivered by rotary pumps having a rating of 300 gal. a minute. The ammonia condensers are of the compression, belt-driven, open-atmosphere type manufactured by the York (Pa.) Manufacturing Company, which is making the present installation. The pumps and condensers will be belt-driven from four direct-current 220-volt motors having an aggregate rating of 120 hp. The installation is to have a refrigerating capacity of from 20 tons to 30 tons, the actual refrigeration being accomplished in six coils of double-pipe brine coolers, through which the rotary pumps circulate the brine. Approximately 2500 ft. of piping will be used for the brine-supply mains, which are to be covered with compressed cork and white-painted canvas.

New Company Incorporated.—For the purpose of building a large central station at Floodwood, in the heart of the Hocking Valley coal field in Ohio, the Ohio Electric Securities Company has been incorporated in Mainz with $2,500,000 common stock and $1,500,000 7 per cent preferred stock. No bonds will be issued. The financing was done by Close Brothers, of London, it is said. The plans of the company contemplate a station of 4500-kw rating. Other units may be aded as the demand requires. Under the name of the Hocking Power Company this company now controls a number of small plants in the Hocking coal district. The energy will be sold at wholesale to utility companies operating in central Ohio. The company will obtain its fuel from mines situated on its own property and will probably supply energy to many of the sixty mines which are now operating in that section.

Platinum Production in 1913.—According to the United States Geological Survey, the high price of platinum encouraged prospecting in this country in 1913, although the expected increase in the production of crude metal was not realized. The total production from California and Oregon, the two sources of platinum ore in this country, amounted to 482.87 crude ounces and was valued at $18,477. A considerable output of platinum is also obtained in the United States from the refining of gold and copper bullion. A portion of this platinum originates in old scrap, sweepings, etc., sold by jewelers and dentists. About 650 fine ounces, however, was derived in 1913 as new metal from gold and copper bullion from domestic mines. The production of refined platinum in this country in 1913 from domestic sources was 1034 troy ounces, valued at $46,530, against 1005 troy ounces, valued at $45,778, in 1912. Russia's output of crude platinum in 1913 was 250,000 troy ounces. The value of platinum imported for consumption in the United States in 1913 was valued at $5,040,210, against $4,503,682 in 1912.

Transmission-Line Calculator.—A new edition of the transmission-line calculator made by Mr. R. W. Adams, 180 Taber Avenue, Providence, R. I., which was described in the *Electrical World*, July 15, 1911, has been issued. The engineer's edition of this calculator, as the new issue is called, contains separate diagrams for sixty-cycle and twenty-five-cycle work, each having its own revolving transparent disk and each being laid out for four different spacings of conductors. The diagrams have been doubled in size over the first edition, so that the various scales are more open and therefore more easily read, while at the same time covering a wider range of conditions. The new ranges of the scales are as follows: Systems, single-phase, two-phase and three-phase alternating current and direct current; frequency, 25 cycles or 60 cycles; load, 1 kva to 20,000 kva; voltage, 100 volts to 70,000 volts; distance, 100 ft. to 100 miles; power-factor, 1 per cent to 100 per cent lagging or leading; conductor material, copper, aluminum or copper; conductor size, No. 8 B. & S. to 1,000,000 circ. mil; conductor spacing, 6 in., 18 in., 36 in. or 60 in., and line drop or loss, 0 per cent to 40 per cent. Other improvements include provision for determining line loss direct in percentage of delivered power and for calculating regulation or internal drop in transformers. The new edition of the transmission-line calculator is bound in morocco leather.

Imports and Exports for August.—The monthly summary of the foreign commerce of the United States issued by the Bureau of Foreign and Domestic Commerce shows the imports in electric lamps to have been valued at $53,403 in August, 1914, and $34,296 in August, 1913. This unusual increase may represent the output of foreign manufacturers who hastened shipment in the early days of the war. The principal gain was in metallic-filament lamps, which increased 87 per cent, or from $28,311 to $52,948. There were no arc-lamp imports in August and imports of carbon-filament lamps had a value of but $455. Exports, on the other hand, declined from $2,279,015 in August, 1913, to $1,024,010 in August, 1914. The value of batteries decreased from $45,326 to $38,722, generators from $134,136 to $114,570, fans from $46,408 to $5,528, insulated wires and cables from $219,736 to $51,236, interior wiring supplies and fixtures from $66,385 to $43,511, arc-lamps from $10,387 to $1,620, incandescent-lamps from $69,522 to $11,930, motors from $419,280 to $118,490, static transformers from $156,727 to $33,609, telegraph instruments from $6,425 to $3,101, telephones from $189,160 to $78,403, and "all others" from $952,705 to $497,543. The only increase was in meters and measuring apparatus, the value of which was $23,747 in August, 1914, as compared with nothing in the previous year.

New Factory Opened.—A four-story extension of "Factory M," at the Center Street works of the General Electric Company, Lynn, Mass., was thrown open on the evening of Oct. 2. The occasion was signalized by an exhibition of the company's latest products, the entire first floor of the factory being occupied by the exhibits and a hastily assembled "midway." The Lynn Gas & Electric Company maintained an attractive exhibit of electrical household devices, and a number of demonstrators were present to display the equipment to the best advantage. In the exhibit of the turbine department interest centered upon a new development in the form of a 150-watt, 6-volt turbo-generator set designed for locomotive head lamp and cab illumination. This apparatus was equipped with a main parabolic reflector and a 100-watt cone-filament, gas-filled lamp, yielding 600,000 beam candle-power. The reflector was provided with an auxiliary 5-watt lamp which is automatically thrown into service in case the main unit fails and is also useful in yard and terminal operation. The wiring was in heavy conduit. The equipment also included several 5-watt lamps for cab and classification lighting in place of the old-time oil lamps. The turbine was said to be the smallest thus far built, and was of the single-stage type. Tests show that the gas-filled head lamp is effective in penetrating power, and its steadiness is proving of value in a trial installation on the Boston & Maine locomotive No. 3667. The arc-lamp department exhibited a model of various types of street lighting equipped with miniature lamps and different-spaced units, a sectional cabinet for the comparison of the color-matching characteristics of various lighting units with and without color screens, "white way" transparencies of installations at Lynn and New Haven, ornamental luminous-arc lamps, artistic globes, and a shadow booth showing the effects of different lighting schemes with color and directional variations upon a posed subject. Other exhibits included a full display of rectifying apparatus, automobile motors, tools produced by company apprentices, and portable and station meters, the latter display illustrating the evolution of both alternating-current and direct-current instruments from the original designs of nearly thirty years ago to the latest types.

NEW YORK METAL MARKET PRICES

	Sept. 29	Oct. 6
Copper:		
Prime Lake	12.12½ to 12.37½†	.... to 12.00†
Electrolytic	11.80 to 11.90†	11.60 to 11.70†
Casting	11.70 to 11.80†	11.50 to 11.60†
Copper wire base	..... to 13.25	13.00 to 13.25
Lead	3.75	3.60
Nickel	40.00 to 45.00	40.00 to 45.00
Sheet zinc, f.o.b. smelter	8.50†	8.50†
Spelter, spot	5.15 to 5.20	4.90 to 5.00
Straits tin	30.87½†	31.00†
Aluminum, 98 to 99 per cent.	18.25 to 18.75	..... to .....

COPPER EXPORTS

Total tons to Oct. 6	3,245

†Nominal.

NOTE.—The New York Metal Exchange and the London Metal Exchange have been closed until further notice.

Corporate and Financial

Byllesby Properties Declare Dividends.—H. M. Byllesby & Company recently announced the declaration of the usual dividend of 1.75 per cent upon the preferred stock of the following companies for the quarter ended Sept. 30, payable Oct. 15: Northern States Power Company, Western States Gas & Electric Company, and Ottumwa Railway & Light Company.

Niagara Company Authorized to Issue Notes.—The Public Service Commission of the Second District of New York has authorized the issue of $800,000 two-year secured 6 per cent gold notes by the Niagara, Lockport & Ontario Power Company, to be sold at not less than 95. The proceeds, with $140,000 from other sources, are to be used to take up the one-year gold notes issued a year ago by the company.

Annual Report of Eastern Pennsylvania Railways Company.—The consolidated statement of earnings and expenses of the Eastern Pennsylvania Railways Company and subsidiary companies for the year ended June 30, 1914, shows gross earnings to have been $826,416. From this is deducted $503,488 for operating expenses and taxes, leaving $322,928 as net earnings from operation. A further deduction of $45,525 for underlying companies' charges leaves $277,403 as a balance. Interest and rentals are set down as $178,493, giving a surplus for the year of $98,910. The earnings of the electric department increased $43,415 during the year. Mr. John H. Pardee, the president, stated that with the exception of one loan of $25,000 and its current accounts the company has no floating indebtedness at the present time.

Annual Report of the Terre Haute, Indianapolis & Eastern Company.—The annual report of the Terre Haute (Ind.), Indianapolis & Eastern Traction Company for the year ended Dec. 31, 1913, shows gross earnings from operation of $3,112,382. This, less operating expenses of $1,719,907, leaves $1,392,475 as net earnings, which is further reduced to $1,264,425 by taxes amounting to $128,050. Income from other sources of $289,029 and sale of energy from the West Tenth Street station amounting to $95,368 increased the earnings to $1,648,822. Deducting $802,242 for bond interest, $209,496 for dividends, $23,932 for interest on notes and $3,000 for office maintenance and leased lines leaves a surplus of $610,152. From this is deducted for the sinking fund $114,873 and $455,000 for the preferred dividend of the Terre Haute, Indianapolis & Eastern Traction Company, leaving a balance of $40,279. Mr. Robert I. Todd, president of the company, stated in his report that the company's new power house at West Tenth Street and White River would not only supply energy for the railways but also that it would be a source of revenue to the company from the sale of energy to other lines.

Eastern Pennsylvania Power Company's Coupons Purchased.—Lee, Higginson & Company, of Boston, in a letter to holders of the Eastern Pennsylvania Power Company first and refunding 5 per cent bonds, stated that they had been informed by the Commercial Trust Company of Philadelphia, trustee under the first and refunding mortgage of the Eastern Pennsylvania Power Company, that it has not been supplied with funds to pay interest due on Oct. 1. The bankers say: "We are informed that the company's action in deferring this payment is due to the present financial stringency and the consequent inability to sell securities to reimburse its treasury for expenditures heretofore made for additions and extensions to its properties. It is hoped that the company will be able to adjust its affairs so as to cure this default before Jan. 1, 1915. We believe that both the physical value and the earnings of the properties on which these bonds are a first lien afford ample security for these bonds. Since these bonds were sold their position has been decidedly strengthened. No additional bonds of this issue have been sold, so that the amount outstanding remains at $1,880,000. A large amount of additional property, however, has been acquired and financed by the sale of junior securities. In order that the bondholders may suffer no inconvenience at this time Lee, Higginson & Company, acting entirely independently of the mortgagor company, are prepared to purchase the Oct. 1, 1914, coupons from these bonds."

Annual Report of American Railways Company.—The fifteenth annual report of the American Railways Company, Philadelphia, Pa., for the year ended June 30, 1914, has been presented to the stockholders by Mr. J. J. Sullivan, the president. The report shows gross income of $1,036,361, made up of $981,943 as income from sub-companies and $5,418 as miscellaneous income. From the gross income was deducted $442,532 as follows: General expenses, $18,839; legal expenses, $375; depreciation of office furniture and engineering instruments, $1,279; taxes, $15,000, and interest on funded debt, $407,039. This left $593,829 as net income, from which was deducted $140,000 as dividends paid and accrued on capital preferred stock and $402,789 as dividends paid on common stock, leaving $51,010 as surplus for the year. To this was added surplus at the beginning of the year of $648,436 and additional surplus through the profits from the sale of the Johnstown Passenger Railway of $548,469, thus making the total surplus $1,247,945. From this was deducted $500,000 as contributions to the reserve for depreciation of the subsidiary companies, $5,485 as amount set aside for United States income tax arising from profits on sale of property, and $187 as other adjustments within the year, leaving $742,273 as surplus at close of the year.

Pennsylvania Water & Power Company Offers Bonds.—In a letter Mr. J. E. Aldred, president, states that the company offered to stockholders of record Sept. 22 $500,000 of first mortgage 5 per cent gold bonds at 88 and interest. The time limit is placed at Oct. 30, 1914. The following is quoted from Mr. Aldred's letter: "In view of the unusual conditions prevailing in the financial world brought about by the deplorable European conflict, your directors consider it their duty to acquaint shareholders with the progress made since the last annual report was published, so that at this time, when market quotations are unavailable, holders of this company's shares will have full knowledge of the status of their investment. We are pleased to report that for the eight months ended Aug. 31, 1914, the gross earnings show an increase over the same period last year of $161,169, or 31 per cent, with a corresponding increase in net of $147,321, or 34 per cent. The position of your company is particularly strong in the present crisis, in that it owes to banks only $100,000, whereas it has considerably more than this amount on hand in cash, while the fact that it sells its entire output of energy to public utility companies assures the receipt of its future revenue in cash. The second transmission line to Baltimore has been completed and is in operation, and the eighth generating unit will be in operation in about one month, making the total installed capacity of the plant 111,000 hp. These extensions will at once further materially increase the company's revenue."

Declares Preferred Dividend, Omits Common.—In connection with the declaration of the regular dividend on the preferred stock and the omission of the dividend on the common stock the following letter has been sent by directors of the Puget Sound Traction, Light & Power Company, Seattle, Wash., to stockholders: "During the past two years the Puget Sound district has suffered from a general depression in business which has prevailed throughout the Pacific Coast States and British Columbia. This condition has been reflected in the net earnings of this company, which, as appears from the report of the company, have shown a decrease in the balance available for common-stock dividends. It was hoped that the Pacific Coast as a whole would benefit materially by the opening of the Panama Canal and the development of Alaska which was expected to follow the recent action of the federal government. The improvement hoped for has undoubtedly been much retarded by the unprecedented conditions caused by the foreign war. Since Aug. 1 foreign shipments of lumber have shown a marked decrease due to lack of shipping facilities, and the salmon industry has been held back for the same reason. Fortunately, the crops of both Washington and Oregon are very good this year. The company has cut its operating expenses as far as possible without injury to service, and has stopped all new construction, except such as is nearly finished and such as is required by the terms of its franchises. As the company has a substantial cash balance and no floating debt, it is in a strong position financially, but as it is impossible to estimate how long the present business depression will continue, the directors believe that the company's resources should be conserved. After carefully considering the above circumstances, the directors have decided not to declare the quarterly dividend of 1 per cent on the common stock, which would normally be paid on Oct. 15. As there is, however, an ample margin over the preferred-stock dividend requirements, the directors have declared the regular cumulative quarterly dividend of 1½ per cent on the preferred stock, payable on Oct. 15."

Dayton Power & Light Company's Bond Exchange Plan.—The Dayton (Ohio) Power & Light Company has presented to the holders of the Dayton Lighting Company first and refunding mortgage gold bonds, due 1937, a plan which has been approved by the Public Utilities Commission of Ohio, to exchange their bonds for Dayton Power & Light Company first and refunding mortgage 5 per cent gold bonds, due June 1, 1941. There are now outstanding $3,684,000 bonds, of which $2,579,000 are Dayton Lighting Company 5 per cent bonds, due 1937; $380,000 are Dayton Electric Light Company 5 per cent bonds, due 1921, and $725,000 are Dayton Power & Light Company 5 per cent bonds, due 1941. The plan is to have the holders of the Dayton Lighting Company bonds present them on or about Sept. 1, 1914, with all the coupons attached falling due on and after March 1, 1915, at the office of the Columbia Trust Company, New York, which will give in exchange Dayton Power & Light Company bonds, par for par, with bond interest coupons for June 1, 1915, and subsequent dates attached, and will also give with each thousand-dollar bond of the Dayton Power & Light Company when the exchange is made, provided that it is made prior to Dec. 1, 1914, a negotiable warrant, good for three months' bond interest, at the rate of 5 per cent per year from Sept. 1, 1914, to Dec. 1, 1914. These warrants have the same rights as the bond coupons have, and it is necessary to issue these warrants for three months' bond interest on the Dayton Power & Light Company bonds because the six months' bond-interest-paying date on the Dayton Lighting Company bonds is Sept. 1, 1914, while the six months' bond-interest-paying date on the Dayton Power & Light Company bonds is Dec. 1, 1914.

Annual Report of the Mexican Light & Power Company, Ltd.—The ninth annual report of the Mexican Light & Power Company shows operations of the company for the year ended Dec. 31, 1913. The net revenue from operation for the year 1913 amounted to 6,194,649 pesos, as compared with 5,653,032 pesos for 1912. This revenue, converted into Canadian currency at the average monthly rate of exchange, gave a profit from operation of $2,614,849 gold. The increase over last year in pesos is 541,617, but when converted into Canadian currency the profit from operation, as compared with last year, shows a decrease of $211,666 gold, and this fact is accounted for by the heavy fall in the rate of exchange. To the profit from operation has been added the income from securities and other sources of $177,862, and the credit balance of $1,184,405 brought forward from last year, making a total credit on profit and loss account for the year of $3,977,117. Out of this sum have been paid the current expenses and fixed charges, amounting to $2,289,573, and dividends at the rate of 7 per cent on the preference shares and 4 per cent on the ordinary share capital of the company, leaving a credit balance on the profit and loss account of $724,142, of which $405,619 has been transferred to the reserve account and the balance, $318,523, has been carried forward. The amount standing to the credit of the reserve account at the end of 1912 was $300,000, which, together with $405,619 appropriated out of profits, makes a total of $705,619. This sum has been applied in writing down the value of certain of the company's investments and accounts and providing for the extraordinary expenditures incurred by the company during the year, including the expenses of protecting its properties on account of the disturbed conditions in Mexico. Mr. V. de B. Daly, secretary of the company, stated that since the beginning of the present year the board has considered it advisable, owing to the continued state of political unrest in Mexico and the consequent heavy fall in exchange, to defer for the present the payment of further dividends on the share capital of the company. The policy adopted by the board for the protection of the company's properties during the disturbances of 1912 has remained unchanged, and although considerable extraordinary expenditure has been incurred

in connection therewith, the board is glad to report that the company has been able to continue operation and has not sustained any serious damage to its properties.

NEW ENGLAND UTILITIES SHOW GAIN

Central Stations Experience Larger Growth in July than in Either May or June

Comparative figures from 60 per cent of the electric utility industry of New England for the months of May, June and July, 1913 and 1914, show that the central stations in the Northeast are growing rapidly. The rate of income growth, as seen in Table I, was larger in July than in the two previous months, while the rate of output growth was not quite so good as that in June, but far better than that in May. While the war did not have any effect at all on July operations, there were other facts which entered in to weaken materially industrial conditions. Table II shows the figures for 70 per cent of the industry for July, and these figures bear out the comparative figures in Table I.

To show the exact state of affairs, the companies, excepting the holding companies, have been placed in groups first by states and second by the size of the communities in which they operate. The population of the cities was taken as that of 1910. From Massachusetts fifteen companies, representing roughly 80 per cent of the industry of the State, showed an aggregate income from the sale of energy of $882,026 in July, 1914, as against $717,774 in the corresponding month of the previous year, or an increase of 23 per cent. The output of the same companies grew from 23,182,816 kw-hr. to 29,416,974 kw-hr., or 26.9 per cent. Four companies, representing 60 per cent of the industry of Maine, showed a total income for July, 1914, of $244,637 and for July, 1913, of $235,855—a growth of 3.8 per cent. The output growth was 5 per cent, from 5,716,756 kw-hr. to 5,998,543 kw-hr. Two companies reporting for Rhode Island represent two-thirds of the industry of that State. Their income increased 12 per cent, from $125,611 to $140,610, and their output increased 23.6 per cent, from 3,438,960 kw-hr. to 4,246,003 kw-hr. In New Hampshire six companies, representing a little more than one-third of the State, gave an income growth of 5 per cent, from $89,539 to $94,059, and an output growth of 4.2 per cent, from 3,879,019 kw-hr. to 4,041,938 kw-hr. In Connecticut the output increased 20.9 per cent, from 5,057,408 kw-hr. to 6,112,122 kw-hr. The income increased 7.5 per cent, from $172,551 to $185,456. The returns are from five companies, representing only 50 per cent of the industry. Some of the figures would probably be changed if the reports of holding companies could be segregated, because in the above only the figures from the separate operating companies are combined.

TABLE I—COMPARATIVE RETURNS FOR MAY, JUNE AND JULY, 1913 AND 1914, COVERING 60 PER CENT. OF THE CENTRAL-STATION INDUSTRY OF THE NEW ENGLAND STATES

	Income Derived from Sale of Energy			Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	$1,704,102	$1,573,119	8.4	51,519,410	49,752,133	3.6
June	1,467,791	1,356,552	8.3	50,456,031	45,268,312	11.6
July	1,551,797	1,419,597	9.3	50,644,731	45,861,737	10.4

The same companies have been recombined in groups according to the population of the communities which they serve. Five groups have been chosen—the first for communities of over 100,000 population, the second for those communities having a population between 50,000 and 100,000, the third between 25,000 and 50,000, the fourth between 10,000 and 25,000, and the fifth under 10,000 inhabitants.

The first group contains companies operating in Boston, Worcester, Fall River, Cambridge and Providence. The aggregate income was $742,543 in July, 1913, as against $663,028 in the previous year, an increase of 12 per cent. In output the growth was 14.9 per cent, from 19,174,623 kw-hr. to 22,053,703 kw-hr. The seven companies in the second group, representing all states but Rhode Island, had a total income of $481,629 in July, 1914, and $456,658 in 1913, or a growth of 5.5 per cent. The same companies showed a growth in output of 9.2 per cent, from 12,568,328 kw-hr. in 1913 to 13,711,364 kw-hr. in 1914. Eight companies make up the third group, and all states but Maine are represented. The income grew at the rate of 19.8 per cent, from $65,786 to $78,768. The output, however, decreased 1.4 per cent, from 3,921,927 kw-hr. in 1913 to 3,864,900 kw-hr. in 1914. The fourth group, comprising companies in towns of from 10,000 to 25,000 inhabitants, contains twelve companies, representing all states but Rhode Island. The total income from energy sales grew from $148,059 in July, 1913, to $240,432 in July, 1914. This

TABLE II—RETURNS FOR APRIL, MAY, JUNE AND JULY FOR ALL NEW ENGLAND COMPANIES REPORTING TO ELECTRICAL WORLD

	Income Derived from Sale of Energy			Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
April (52 per cent of industry)	$1,501,773	$1,384,255	8.5	43,386,624	39,181,988	10.8
May (63 per cent of industry)	1,745,160	1,609,234	8.4	52,752,247	50,779,103	3.9
June (67 per cent of industry)	1,560,872	1,442,178	8.3	53,463,013	48,049,756	11.1
July (70 per cent of industry)	1,670,819	1,530,410	9.2	54,074,533	49,255,893	9.8

is an increase of 62.4 per cent. The output grew at the rate of 68 per cent, from 6,137,343 kw-hr. to 10,280,947 kw-hr. Only two towns with less than 10,000 people were represented in the group, one in Vermont and the other in New Hampshire. Their total income in July, 1914, was $15,771 and in 1913 was $8,883. This is a growth of 77 per cent. Their output increased 21.3 per cent, from 1,456,814 kw-hr. to 1,204,664 kw-hr. Little can really be said of the last group since it contains but two companies. Of the other groups, however, it is evident that the central stations in communities whose population is between 10,000 and 25,000 are growing most rapidly.

Early Returns for August

Between 30 and 40 per cent of the industry has sent in returns so far for August's operations. While this is but a small part of the whole, nevertheless it contains instances which seem clearly to indicate what is to be expected from the remainder. August was the first month of the war. The stock exchanges were closed and money was tight. Industries were curtailed and conditions generally badly depressed. It was, therefore, to be expected that in certain localities central stations would not do so well as in the previous year. Such was the case in many instances, but the decreases were so small that the totals were not greatly affected and an increase was shown throughout the country. Out of fourteen New England companies, six showed decreases, but they were with one exception small companies and their losses were small indeed. They were not large enough to register a decrease for the entire territory, nor even to make a very low increase. The income increase was up to previous months. Three companies out of thirty-three in the Atlantic States showed decreases, one small, one medium and one large company. In the Central States three companies out of thirty-eight showed decreases. The only one to show any appreciable failing has been showing a decrease for the past half year. The Mountain States show that out of twelve companies five suffered a decrease.

Business Notes

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has changed the address of its Cincinnati office to 812 Gwynne Building.

Eadie, Freund & Cambell.—J. G. Eadie, M. Freund and J. K. Cambell have established the firm of Eadie, Freund & Cambell, consulting engineers, with offices at 7 West Forty-fifth Street, New York.

The Okonite Company.—W. T. Kyle has joined the sales force of the Okonite Company, 253 Broadway, New York. Mr. Kyle for the past six years has been district sales manager for the Duplex Metals Company.

The Nungesser Carbon & Battery Company.—The officers and directors of the Nungesser Carbon & Battery Company, Cleveland, Ohio, recently presented to Philip Nungesser a handsome silver loving cup to commemorate the twenty-fifth anniversary of his connection with the dry-battery business.

Federal Sign System (Electric).—E. A. Lambrecht has been appointed manager of the Wisconsin district of the Federal Sign System (Electric), with headquarters in the Public Service Building, Milwaukee. F. D. Sweet has also been appointed manager of the company's Indianapolis office at 115 East Ohio Street. These two offices were formerly under the jurisdiction of the Federal Sign System's main office in Chicago.

Bijur Motor Lighting Company.—James Dixon, who for the last four years has been a member of the construction department of the Crocker-Wheeler Company at Ampere, N. J., has recently joined the staff of the Bijur Motor Lighting Company, with headquarters at Hoboken, N. J. Mr. Dixon was associated with Mr. Bijur in the past, having been sales manager of the General Storage Battery Company, of Boonton, N. J., of which Mr. Bijur was president.

Morgan Crucible Company.—On Oct. 1 D. M. Donnan resigned his position with the Boston sales office of the Westinghouse Electric & Manufacturing Company to become the manager of the Electrical Engineering & Manufacturing Company, with offices in the First National Bank at Pittsburgh, which will represent the Morgan Crucible Company, Ltd., in the Pittsburgh district for the sale of "Morganite" and "Battersea" carbon brushes. For a number of years prior to going to Boston Mr. Donnan was connected with the New York and East Pittsburgh offices of the Westinghouse Electric & Manufacturing Company.

New Industrial Companies

The Griser Electric Water Heater Company, of New York, N. Y., has been incorporated with a capital stock of $10,000 by David Horwitz, 719 Eastern Parkway, Brooklyn; D. M. Cohn, of New York, and L. B. Funk, Brooklyn.

The Truax Electric Company, of Wilmington, Del., has been chartered with a capital stock of $25,000 to do a general contracting and electrical supply business. The incorporators are Humphrey Lynch, John M. Truax and Joseph Lynch.

The S. W. Fuller Electric Company, of Boston, Mass., has been incorporated with a capital stock of $50,000 by G. C. Willis, of Allston, Mass., and D. F. Cunningham, of Boston, Mass. The company proposes to manufacture and deal in electrical appliances.

The James Farrant Company, of Paterson, N. J., has been incorporated with a capital stock of $5,000 by James Farrant, E. Farrant, both of 428 Van Houten Street, and Henry H. Smart, 663 Twenty-second Street, Paterson, N. J. The company proposes to do a general electrical contracting business.

The International Automatic Utilities Company, of Chicago, Ill., has been chartered with a capital stock of $9,000 to manufacture and act as sales agents for electric-light specialties and other electric fixtures. The incorporators are R. F. Van Meter, J. Paul Johnston, John Johnston and Vincent S. Johnston.

Trade Publications

Electric Wagon Loaders.—Motor-driven wagon and truck loaders are the subject of Catalog No. 190 issued by the Link-Belt Company, Chicago, Ill.

Window Displays.—A catalog entitled "New Ideas in Window Display" has been brought out by the Westinghouse Lamp Company, 1261 Broadway, New York.

Boiler Compound.—The Perolin Company, 1112 West Thirty-seventh Street, Chicago, Ill., has recently published several booklets which describe a boiler compound called "perolin."

Direct-Current Test Meter.—The Thomson direct-current test meter is described and illustrated in Bulletin No. 46,390 issued by the General Electric Company, Schenectady, N. Y.

Electric Insulation.—The properties of various kinds of electric insulation are described in a twelve-page booklet issued by the Boonton Rubber Manufacturing Company, Boonton, N. J.

Mine Hoist Equipment.—Various kinds of electric mine-hoist apparatus are described and illustrated in Bulletin No. 48,041 issued by the General Electric Company, Schenectady, N. Y.

Controller for Feed of Arc Lamps.—The Speed Controller Company, 257 William Street, New York, has issued leaflets describing a device for controlling the feed of arc-lamp electrodes.

Portable Substations.—"Higher Voltages for Electric Traction" is the title of a booklet issued by the Railway & Industrial Engineering Company, Pittsburgh, Pa., in which portable substations are described.

Handbook of Electricity.—The Hotpoint Electric Heating Company has recently issued a thirty-one-page booklet for educating the public in the meaning of electrical terms and the use of electrically operated appliances.

Small Lighting Generator.—A generator and auxiliary equipment for lighting automobiles, motorcycles and motor boats is described in Leaflet No. 68 issued by the Carleton Company, 170 Summer Street, Boston, Mass.

Dishwashing Machines.—Electric dishwashing machines for hotels and restaurants are described and illustrated in a catalog issued by the Bromley-Merseles Manufacturing Company, Broadway and Thirty-fourth Street, New York.

Flaming Arc Lamps.—The Kandem Electric Company, 49 East Twenty-first Street, New York, has issued a booklet entitled "Has the American Business Man Lost His Nerve?" which enumerates some of the advantages of flaming-arc lamps.

Electric Polishing and Grinding Machines.—Various types of electric grinding and polishing machines are described and illustrated in Bulletin No. 156 published by Roth Brothers & Company, Adams and Loomis Streets, Chicago, Ill.

Thermo-Relay.—A circular describing and illustrating a device for controlling electric circuits by means of the heating effect produced has been issued by the Baruch Electric Controller Corporation, 424 Thirteenth Street, Oakland, Cal.

Electrical Apparatus.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has issued a number of bulletins which describe its automatic machine-tool controllers, regulators, magnetic controllers, starting rheostats, crane controllers, hoist controllers and drum-type reverse switches.

Electrical Apparatus.—Electric monorail cranes are fully described and illustrated in Bulletin No. 48,700 published by the Sprague Electric Works of the General Electric Company, 527 West Thirty-fourth Street, New York. Electric dynamometers are the subject of Bulletin No. 48,701, and electric hoists of Booklet No. 906, issued by the same company.

Carbon Brushes.—The Speer Carbon Company, St. Mary's Pa., has recently prepared a seventy-two page catalog in which it describes its brushes and connectors, giving the prices of various sizes of railway-motor, commercial-motor, slip-ring and metallic-composition brushes with curves showing their characteristics at different current densities.

Personal Mention

Mr. George W. Anderson, of the Massachusetts Public Service Commission, has been nominated United States attorney for the Massachusetts district by President Wilson.

Mr. A. W. Sumner, for the past ten years assistant superintendent of the Rockingham County Light & Power Company, Portsmouth, N. H., has tendered his resignation, effective Oct. 15.

Mr. Roscoe Conklin has been appointed manager of the Leominster (Mass.) Electric Light & Power Company as successor to Mr. Alfred Montgomery, whose resignation was announced in these columns on Sept. 12, 1914.

Mr. L. B. Lucas, of Toronto, Ont., has been appointed a member of the Hydro-Electric Power Commission of Ontario, replacing Hon. J. S. Hendrie, who has been appointed Lieutenant-Governor of the Province of Ontario.

Mr. Thurston Owens, secretary of the San Diego (Cal.) Gas & Electric Appliance Company, has been elected president of the San Diego Electrical League. Mr. Owens was formerly manager of the La Crosse (Wis.) Gas & Electric Company.

Mr. W. B. Voth, who has been superintendent of light and power for ten years of the Sheboygan (Wis.) Railway & Electric Company, has been appointed chief engineer of the Empire United Railways of New York, with headquarters at Syracuse, N. Y.

Mr. A. B. Marsden, of the Marsden Electric Company, Rutland, Vt., has resigned as secretary and treasurer of the Vermont Electrical Association. He is succeeded by Mr. C. H. West, secretary and treasurer of the Rutland Railway, Light & Power Company.

Hon. J. S. Hendrie, of Hamilton, Ont., and formerly one of the Hydro-Electric power commissioners of Ontario and chairman of the railway committee of the Ontario Legislature, has been appointed Lieutenant-Governor of the Province, succeeding Sir J. M. Gibson.

Mr. N. B. Rhoads, formerly manager of the Waycross (Ga.) Street & Suburban Railway Company, has resigned to accept a position as general superintendent of the Southern Railway & Light Company, Natchez, Miss., which operates the street railway, electric and gas plants.

Mr. W. F. Raber, vice-president and manager of the Arkansas Valley Railway, Light & Power Company, Pueblo, Col., served as president of the Colorado State Fair, held at Pueblo Sept. 14 to 19. Under his guidance exhibits at the fair this year were better than usual and the attendance was greater.

Dr. Arthur E. Kennelly, professor of electrical engineering at Harvard University, has been appointed director of electrical research at the Massachusetts Institute of Technology, Boston, under the new co-operative agreement between the two institutions. Dr. Kennelly will also continue his work as head of his department at Harvard.

Hon. Adam Beck is no longer a member of the Ontario government without portfolio, his retirement as Minister of Power in the Ontario government being at his own request, on the reorganization of the government. Mr. Beck will devote his entire attention to the Hydro-Electric Power Commission of Ontario, of which he still is chairman.

Mr. Frank B. Dunn recently resigned his post of equipment engineer with the Western Electric Company, Hawthorne, Ill., and has taken up graduate work in telegraphy and telephony in the Ohio State University, Columbus, Ohio. Mr. Dunn is a graduate of the electrical engineering department of the Nanyang College, Shanghai, China.

Mr. O. H. Caldwell, who succeeds Mr. W. E. Keily in the Chicago office of the *Electrical World* and will direct editorial work in the central portion of the country, is a graduate of Purdue University. Both before and after graduation he was associated with Mr. Keily in editorial work on the *Western Electrician.* Subsequently he was connected with the publication department of the Westinghouse companies in Pittsburgh. Mr. Caldwell has been a member of the editorial department of the *Electrical World* since January, 1910. He has been connected with the Chicago and New York editorial staffs of this publication and has traveled in all sections of the country in its interests.

Mr. Orin B. Coldwell, who was recently elected president of the Northwest Electric Light & Power Association, is general superintendent of the light and power department of the Portland (Ore.) Railway, Light & Power Company and one of the best-known operating men in the Northwest. Mr. Coldwell was born in Salem, Ore., Nov. 28, 1875. After completing the regular grammar school course, he attended the Portland High School, and before completing the course entered the employ of the Willamette Falls Electric Company in 1892. This company was one of the pioneer electric transmission companies, having started operations in 1899 with a hydroelectric station at the falls of the Willamette River, Oregon City, and a 14-mile transmission line to Portland. During the five years 1892-1897 Mr. Coldwell was engaged in one capacity or another in practically all of the departments of the Willamette Falls company and its successor, the Portland General Electric Company. In the fall of 1897 Mr. Coldwell entered Stanford University as a special student in electrical engineering. Three years were put in at this university, the summer vacation periods being spent in Portland in the employ of the Portland General Electric Company. Mr. Coldwell was thus enabled to keep in touch with the practical side of the business, at the same time helping himself financially to carry on his college work. At the university, in addition to his regular work, he at times was engaged in house wiring and laboratory work of a remunerative nature. Mr. Coldwell entered Cornell University in the fall of 1900 as a student in the electrical engineering course of Sibley College and was graduated with the class of 1902. Returning to Portland, he again entered the service of the Portland General Electric Company as assistant superintendent, and from that time on he has filled successively a number of positions with the company and its successor, the Portland Railway, Light & Power Company, until at the present time he has charge of all the engineering and operating work of the light and power department. Mr. Coldwell was one of the organizers of the Northwest Electric Light & Power Association and was instrumental in bringing about its affiliation with the National Electric Light Association in 1912. He is a member of both organizations and a fellow of the American Institute of Electrical Engineers.

O. B. COLDWELL

Obituary

A. R. Bell, for many years general superintendent of the Athens (Ohio) municipal electric-light plant, died Sept. 27.

Augustus Wilder Sexton, Jr., treasurer of Westinghouse, Church, Kerr & Company, died Oct. 1 at his home in Montclair, N. J.

H. M. Raphael, a member of the Raphael Electric Company of Pittsburgh, Pa., died at the Passavant Hospital in that city, Sept. 30.

Gardiner M. Lane, of Lee, Higginson & Company, Boston, Mass., and a director in many industrial, railroad and public service corporations, among them the Interborough Rapid Transit Company, New York; Massachusetts Electric Company, Boston, Mass.; Pennsylvania Water & Power Company, Holtwood, Pa.; Puget Sound Electric Railway, Seattle, Wash.; Puget Sound Traction, Light & Power Company, Seattle, Wash.; Rapid Transit Subway Construction Company, New York, and the Seattle (Wash.) Electric Company, is dead.

Construction

New England

DIXFIELD, MAINE.—The local electric-light plant, owned by N. S. Stowell, has been purchased by the Rumford Falls Lt. & Wtr. Co. The system, it is expected, will soon be connected with the Rumford plant.

MECHANIC FALLS, MAINE.—The Mechanic Falls El. Lt. Co. expects to make improvements to its plant, including the installation of a new pair of waterwheels and penstock. A. C. Parker is superintendent.

GREENLAND, N. H.—The Rockingham County Lt. & Pwr. Co., of Portsmouth, has been granted permission by the Public Service Commission to extend its transmission lines into the town of Greenland, a distance of about 3½ miles. The company has been granted a franchise to furnish electricity in the town and has secured a contract for street-lighting.

LACONIA, N. H.—Plans are being considered by the City Council for improvements to the street-lighting system on Main Street.

BARTON, VT.—The Independent Telephone Exchange, recently organized, with a capital stock of $200,000, to take over the rights and properties of the former independent association, will enlarge and extend the lines of the former company.

LYNDONVILLE, VT.—A petition is being circulated in Lyndonville asking that a special village meeting be called to consider the advisability of rebuilding the municipal electric light and power plant. The cost is estimated at from $22,000 to $25,000.

MONTPELIER, VT.—Plans are being considered by the Board of Trade for the installation of an ornamental street-lighting system in the business district.

VERGENNES, VT.—The Vergennes El. Co. has applied to the City Council for permission to replace the arc lamps on Main Street from the city hall to the railroad station with incandescent lamps.

HAVERHILL, MASS.—Bids will be received by the city clerk, City Hall, Haverhill, until Oct. 15, for construction of kitchen building, ward buildings, nurses' residence and all outside corridors of the General Stephen Henry Gale Hospital to be erected by the city of Haverhill on Main Street between Marshland and Hamilton Avenues. Separate bids will be received as follows: Carpentry and masonry, heating and plumbing, electrical work and painting. Plans and specifications may be obtained at the office of James A. Perkins, architect, 47 Merrimack Street, Haverhill, upon deposit of $10, of which $5 will be refunded upon return of same. James W. Harris is head of department of public property.

LUDLOW, MASS.—The electric plant of the Ludlow Mfg. Associates has been purchased by the Ludlow El. Lt. Co., which is owned and controlled by the same interests as the Turners Falls Co., the Amherst Pwr. Co. and the Agawam El. Co., of which Philip Cabot, 11 Devonshire Street, Boston, is president.

NORTHAMPTON, MASS.—The City Council has authorized the installation of two nitrogen lamps of 250 cp to be erected on each of the 38 trolley poles on Main Street, to replace the arch-lighting system now in use. The lamps will be installed by the Northampton El. Ltg. Co.

PEABODY, MASS.—A permit has been granted to the B. E. Cox Leather Co. to erect a concrete power house, 45 ft. by 50 ft., in the rear of its plant at Wallis and Hardy Streets, to cost about $10,000. The E. H. Porter Co. has the contract.

MANCHESTER, CONN.—The Bon Ami Co. is reported to have purchased a large tract of land near its present plant, to be used for future developments. One of the first proposed improvements, it is said, will be the erection of a large power plant.

MILLDALE, CONN.—Work has begun on the construction of the new substation of the United El. & Wtr. Co. in Milldale. The station will supply electricity in Southington, which now secures electrical service from the New Britain plant. Arrangements are being made to light the villages of Milldale and Marion with electricity.

NEW HAVEN, CONN.—At the annual meeting of the United Illg. Co., of New Haven, the proposal to issue $500,000 in capital stock will be submitted to the stockholders.

Middle Atlantic

AMSTERDAM, N. Y.—The capital stock of the Edison El. Lt. & Pwr. Co., of Amsterdam, has been increased from $500,000 to $700,000.

AUBURN, N. Y.—The Empire Gas & El. Co. of Geneva, of Auburn, has been granted a franchise to extend its high-tension transmission line through the township of Aurelius. The company is planning to erect a high-tension line between Auburn and Seneca Falls.

BINGHAMTON, N. Y.—The Blanding El. Supply Co., of Binghamton, has secured the contracts to install electrical equipment in the new high schools in Endicott and Lestershire.

BUFFALO, N. Y.—Bids will be received by Dr. Thomas E. Finegan, assistant commissioner for elementary education, Education Building, Albany, until Oct. 19, for construction of a rear porch on the principal's residence, interior telephones, program bells and fire-alarm system for the State Normal School at Buffalo. Drawings and specifications may be consulted at the New York office of the Department of Architecture, Woolworth Building, New York; office of the Department of Architecture, Capitol, Albany, and at the Buffalo State Normal School, Buffalo.

BUFFALO, N. Y.—Bids will be received by Col. Franklin W. Ward, secretary State Board of Armory Commissioners, 174 State Street, Albany, until Oct. 23, for construction, heating, plumbing and electric work for armory and stable at Buffalo for Troop "I," First Cavalry, National Guard, New York. Drawings and specifications may be consulted at headquarters Fourth Brigade, 451 Main Street, Buffalo, and at Troop "I" Armory, First Cavalry, 426 Humboldt Parkway, Buffalo, and blank forms of proposals may be obtained at the Department of Architecture, Room 1224, Woolworth Building, New York, N. Y. Lewis F. Pilcher, Capitol, Albany, is state architect.

ITHACA, N. Y.—The contract for electrical work in connection with the construction of the New York State Drill Hall at Cornell University at Ithaca has been awarded to Isador Fajans, New York, N. Y., at $9,698.

WEEDSPORT, N. Y.—The Public Service Commission has refused to grant the village of Weedsport authority to install and operate a municipal electric-light plant.

ELYSBURG, PA.—Plans are being considered for the installation in the throwing plant recently erected by the Board of Trade of a 100-kw generator to supply electricity for lighting the town.

LANSFORD, PA.—The present plant of the Lehigh Coal & Navigation Co. at Lansford is about to be shut down, and energy for this place will be supplied by the Lehigh Navigation El. Co. from its Hauto station.

PITTSBURGH, PA.—Owing to the Board of Education having been unable to secure a reduction in the price of electricity from the Allegheny County Lt. Co. for the public school buildings, it is having estimates prepared of the cost of installing electric plants in at least five of the largest school buildings. Most of the 152 school buildings are lighted by electricity, and energy is used in many of the schools for operating shop machinery. C. L. Woolridge is superintendent of buildings of the board of education.

WILLIAMSPORT, PA.—Bids will be received by Samuel Stabler, superintendent of public affairs of the city of Williamsport, until Oct. 26 for lighting the streets, parks and other public places of the city with magnetite-arc lamps and street incandescent lamps for periods of three, five and ten years from Dec. 1, 1914. Bids will also be received for furnishing electricity for lighting the city hall and several fire-engine houses for like periods. For details see proposal columns.

NEWARK, N. J.—To replace the gantry crane which was blown down last July at the Marion power station, the Pub. Ser. El. Co. is installing a similar apparatus of much greater capacity. The last of the contracts for the work has been awarded to the Robins Conveying Belt Co., of New York, N. Y., which will construct an electrically operated and magnetically controlled gantry bridge, at a cost exceeding $50,000. The new span will be 200 ft. long, the old one having been 150 ft. The new crane will have a capacity of 200 tons of coal an hour.

PERTH AMBOY, N. J.—The Board of Aldermen is reported to be negotiating with the Pub. Ser. El. Co. for the installation of 600-cp nitrogen tungsten lamps in the business district.

RAHWAY, N. J.—The Council is planning to install new 400-cp arc lamps in the business district.

WILMINGTON, DEL.—Bids will be received by the Newcastle County Building Commission and the Wilmington Building Commission at the office of the commissions, Church Building, Market and Tenth Streets, Wilmington, until Oct. 20, for electric elevators, etc., for the new county building and the new municipal building. Separate proposals are to be submitted for each building. Drawings and specifications, form of contract and blank form for proposals may be obtained at the office of the commissions. Thomas F. Gormley is secretary of the commissions.

PRINCESS ANNE, MD.—Preparations, it is reported, are being made by E. H. Crane to install an electric-light plant here, to be equipped with a 50-hp gas producer plant and a 50-kw alternator, which have already been purchased. The company will also install a 35-hp gas or oil engine and small alternator. The town has made a contract with Mr. Crane for street lighting, under which 88 tungsten lamps aggregating 6000 sp will be installed.

LYNCHBURG, VA.—Plans, it is reported, have been prepared and submitted by E. C. Wiley for the installation of a municipal electric-light plant, to cost $150,000.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 13, for furnishing at the various navy yards and naval stations the following supplies: Washington, D. C., Schedule 7343—eight motor-driven steel baskets; Schedule 7348—7100 rubber gaskets. Philadelphia, Pa., Schedule 7352—15 fireroom clocks, 80 20-volt water-tight buzzers. Brooklyn, N. Y., Schedule 7352—40,000 ft. telephone cord, 95,000 ft. silk, double-conductor wire, miscellaneous magnet wire, miscellaneous brass pipe fittings. Schedule 7340—600 steel boiler tubes. Schedule 7197—miscellaneous weatherproof sockets, to be delivered at all yards. Newport, R. I., Schedule 7343—3000 ft. brass tubing; Schedule 7344—miscellaneous bronze torpedo tubing; Schedule 7342—6500 lb. steel tubing. Bids will also be received until Oct. 20, as follows: Annapolis, Md., Schedule 7357—one shearing machine. Mare Island, Cal., Schedule 7350—two oil coolers. New York, N. Y., Schedule 7358—three electrically operated hoists. Bids will also be received until Oct. 27 as follows: Chelsea, Mass., Schedule 7401—one automobile ambulance. Annapolis, Md., Schedule 7400—two wall-type galvanometers, one contactor, five field rheostats and one current transformer, one alternating-current generator set, and direct-current motor. Boston, Mass., Schedule 7404—10 pneumatic jacks, suitable for use on Hilles & Jones plate planer No. 7, eight pneumatic jacks, suitable for use on Niles Tool Works planer. Norfolk, Va., Schedule 7406—eight simplex vertical pumps (4-in. by 2½-in. by 4-in.) and spare parts for boiler feed; Schedule 7405—900 sq. ft. copper cloth wire, 36 in. wide. Newport, R. I., Schedule 7403—6000 lb. steel shaft tubing (1 7/32 in. inside diameter, 2 in. outside diameter, cold-drawn and treated). Boston, Mass., Schedule 7360—three marine water-tube boilers; Schedule 7361—miscellaneous air pumps. Bids will also be received until Nov. 3 as follows: Philadelphia, Pa., Schedule 7409—one universal double-arbor bench saw, with 16-in. saws and complete equipment, one 24-in. hand jointer and planer, complete with equipment. Washington, D. C., Schedule 7407—five 48-in. lathe heads, complete with face plates and motor drivers for head and center screws. Brooklyn, N. Y., Schedule 7408—two motor-driven, cold-metal sawing machines. Application for proposals should give the schedule desired by number.

North Central

BAY CITY, MICH.—The contract for electric wiring in the new Young Women's Christian Association Building is reported to have been awarded to the Affleck El. Co., of Bay City.

BEAR LAKE, MICH.—The Benzie County Pwr. Co., of Frankfort, has applied for a franchise to furnish electricity in Bear Lake.

DETROIT, MICH.—Bids will be received by F. T. Bowler, secretary of public lighting commission, until Oct. 13 for furnishing iron pipe, bar iron and flanges, busbar supports and disconnecting switches.

JACKSON, MICH.—Application has been made to the State Railroad Commission by John J. Carton, of Flint, attorney, to authorize bond issues for the following companies: The Saginaw Pwr. Co., $10,000; Bay City Pwr. Co., $9,000; Consumers' Pwr. Co., $10,000; Pontiac Pwr. Co., $20,000; Economy Pwr. Co., $6,000; Ausable Pwr. Co., $272,000; Commonwealth Pwr. Co., $131,000; Grand Rapids-Muskegon Pwr. Co., $81,000, and the Flint El. Co., $9,000.

MARQUETTE, MICH.—The Department of Light and Power expects to purchase within the next six months electrical appliances and supplies, including heating and cooking apparatus, vacuum cleaners, washing machines, wiring supplies, etc., amounting to about $25,000. C. Retallic is manager.

NEWAGO, MICH.—The Board of Supervisors has granted the Grand Rapids-

Muskegon Pwr. Co., of Grand Rapids, permission to construct four dams in Newaygo County, the first to be completed within seven years, the other three within 13, 18 and 22 years, respectively.

VANDERBILT, MICH.—Plans, it is reported, are being considered by John Yuill, of Vanderbilt, to develop a water-power to generate electricity to be distributed in Gaylord and Vanderbilt.

WYANDOTTE, MICH.—Improvements to the new municipal plant for which the sum of $40,000 was recently voted will, it is expected, be completed within four months.

BELLEVUE, OHIO.—The Commissioners of Seneca County have granted the Bellevue Illg. & Pwr. Co. a franchise to erect transmission lines over certain roads in Thompson Township. The company is planning to extend its lines from the Sandusky County lines to Flat Rock to furnish electrical service there.

BUTLER, OHIO.—Bonds to the amount of $4,000 have been voted for the purchase of a gas engine for the municipal electric-light plant. Other improvements will also be made to the system.

CALEDONIA, OHIO.—At the regular election held Nov. 3 the proposal to install a municipal electric-light system, to cost $4,000, will be submitted to the voters.

CINCINNATI, OHIO.—Electrical equipments, it is reported, will be required in connection with the construction of water plants to be installed at Dayton, Middletown and Xenia, which, it is estimated, will cost respectively $750,000, $150,000 and $70,000. Pollard & Ellms, Union Central Buildings, Cincinnati, are engineers in charge.

CLEVELAND, OHIO.—The Continental Gas & El. Corpn., of Cleveland, it is reported, will proceed with its proposed plan of extension and development outlined before the war. The construction budget for the next six months is $250,000.

COSHOCTON, OHIO.—The State Public Utilities Commission has authorized the Ohio Service Co. to issue $630,000 in capital stock, the proceeds to be used to acquire the electric railways and lighting properties at Coshocton, Cambridge, Canal Dover, New Philadelphia, Uhrichsville and Dennison.

DEFIANCE, OHIO.—Investigations are being made by the civic committee of the Chamber of Commerce relative to the installation of a cluster-lamp street-lighting system in the business district.

LONDON, OHIO.—The City Council has authorized the city solicitor to prepare a form for bids for lamp standards, globes, etc., for a cluster-lamp street-lighting system.

ORRVILLE, OHIO.—The Ohio courts have held invalid the bonds issued by the municipality of Orrville for the installation of a municipal electric-light plant. Bonds aggregating $42,000 have been issued by the municipality, but it was held by the courts that the Ohio laws in regard to issue of bonds and also for acquiring an existing electric plant were not carried out. Bonds have been sold and proceeds also paid out on contracts. The court held this to be in contempt, and fines were assessed against the city officials. The case will be carried to the Supreme Court.

SPENCERVILLE, OHIO.—Contracts for construction of the proposed municipal electric-lighting plant will be awarded as soon as bonds, recently authorized, have been sold.

TOLEDO, OHIO.—Bids will be received by the Board of County Commissioners of Lucas County, at the office of the county auditor, Court House, Toledo, until Nov. 6, for construction of power house and furnishing equipment for the new heating, lighting and power plant at the Lucas County Children's Home, in accordance with specifications on file in the office of the county auditor and at the office of E. Bayer, engineer, Nicholas Building, Toledo. Charles J. Sanzenbacher is auditor.

UPPER SANDUSKY, OHIO.—The Hardin-Wyandotte Ltg. Co. has submitted a proposal to the City Council offering a reduction for commercial lighting. The company also offers to sell its property to the city for $30,000. The Council, it is understood, has rejected the proposal to purchase the plant.

WELLSVILLE, OHIO.—The decision handed down by the Supreme Court of Ohio on Sept. 29 upholds the validity of the $60,000 bond issue authorized for the construction of a municipal electric-light plant in Wellsville.

ZANESVILLE, OHIO.—The Southeastern Ohio Ry., Lt. & Pwr. Co. is reported to have applied to the City Council for a franchise to supply electricity in Zanesville.

LOUISA, KY.—Negotiations are under way, it is reported, between the city officials and the Eastern Kentucky Coal Co. to furnish electricity for lighting the town of Louisa from the plant at Torchlight.

WINCHESTER, KY.—Arrangements are being made to extend the ornamental street-lighting system two blocks further to the north, and to the south to the end of the business district.

GOSHEN, IND.—Arrangements are being made by the Hawks El. Co., of Goshen, for the erection of three transmission lines, one to Wekarusa, the second to New Paris via Bainter, and the third to Benton. At Benton the lines will connect with the Syracust Lt. & Pwr. Co., which has a plant at Benton and will furnish electricity for lamps and motors in Syracuse and Milford.

MONON, IND.—W. T. McCaskey & Co. were recently granted a franchise to build an electric road from Monon to Reynolds.

CANTON, ILL.—The State Public Utilities Commission has granted the Canton Gas & El. Co. permission to erect a transmission line from Bryant to the southeast corner of Fulton County.

CANTON, ILL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 10, for construction, including mechanical equipment, lighting fixtures and approaches, of the United States post office at Canton, Ill. Drawings and specifications may be obtained from the above office or from the custodian of site. O. Wenderoth is supervising architect.

CARBONDALE, ILL.—Bids submitted for the power plant, equipment, etc., of the Southern Illinois State Normal University, it is reported, have been rejected by the trustees. James B. Dibelka, 29 South La Salle Street, Chicago, is state architect.

COLLINSVILLE, ILL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 6, for the construction complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Collinsville, Ill. Drawings and specifications may be obtained at the above office or from the custodian of site at Collinsville. O. Wenderoth is supervising architect.

GALVA, ILL.—The Galva El. Lt. Co. has been granted a certificate of convenience and necessity to erect a transmission line from Galva to Cambridge, Oneida and Lafayette for the purpose of furnishing electricity in those places.

HILLSBORO, ILL.—Plans are being considered by the City Council and the Hillsboro Commercial Club for the installation of an ornamental street-lighting system.

JOLIET, ILL.—Work on rebuilding the street-lighting system in Joliet, it is understood, will soon be begun by the Public Ser. Co. of Northern Illinois.

SPRINGFIELD, ILL.—Bids will be received by the State Board of Administration, Capitol Building, Springfield, until Oct. 19 for construction of the following buildings: One cottage for male tubercular patients at the Watertown State Hospital, Watertown; Tuberculosis Hospital at the Anna State Hospital, Anna; cottages for tubercular patients at Kankakee State School and colony, Lincoln; cottages for tuberculosis patients at Kankakee State Hospital, Kankakee; one cow barn at the Anna State Hospital, Anna; one blacksmith's shop at Kankakee State Hospital, Kankakee. Separate bids will be received for the general work, heating, plumbing, including sewerage and electric wiring.

EAU CLAIRE, WIS.—Plans are being considered by the Eau Claire Civic and Commerce Association for the installation of an ornamental street lighting system in the business district.

MILWAUKEE, WIS.—Contracts have been placed by the Twelfth Street Advancement Association with the Milwaukee Ry. & Lt. Co. for the installation of 24 permanent street arches on Twelfth Street, equipped with Federal steel reflectors and 80-watt, 60-cp. Mazda lamps, 14 to each arch. Each lamp is to hang vertically, supported by guy wire. Emil J. Zingen is secretary of the association.

REEDSBURG, WIS.—The distribution lines of the municipal electric-light plant are being rebuilt. O. W. Burkett is superintendent.

DULUTH, MINN.—The City Council has passed an ordinance appropriating $85,800 for the construction and equipment of the first unit for the proposed municipal electric-light plant.

FARMINGTON, MINN.—Within the next three months the Farmington El. Lt. & Pwr. Co. expects to purchase about 100 hp in single-phase and three-phase motors, sizes from ¼ hp to 15 hp. The company is now erecting about 3 miles of 2300-volt primary lines and transformers of 60 kva rating. The Farmington company has closed a contract with the Consumers' Pwr. Co. for energy, 2300 volts, three-phase, alternating current. As soon as the current is delivered the present plant (which is direct current) of the Farmington company will be removed to a new location and put into operation. F. H. Eddy is manager.

KASSON, MINN.—Within the next 30 days the village of Kasson expects to purchase 44 ornamental lamp standards.

WINNEBAGO CITY, MINN.—The Village Council is considering a proposal submitted by H. Merrifield, formerly connected with the Mankato branch of the Consumers' Pwr. Co., and R. B. Bashan, of Omaha, Neb., to lease the municipal electric plant and furnish electrical service here. Under the proposad arrangements a 24-hour service would be furnished.

CORNING, IA.—The City Council is considering the question of calling an election to submit the proposal to establish a municipal electric-light plant in Corning to the voters.

LARCHWOOD, IA.—Bids to the amount of $10,000 have been voted for the installation of a municipal electric-light plant.

LE MARS, IA.—The city of Le Mars, we are informed, does not contemplate the installation of a municipal electric-light plant at this time, as reported in the issue of Sept. 5.

LUVERNE, IA.—Bonds to the amount of $20,000 have been voted for construction of an electric-light plant and pumping station.

MANSON, IA.—The Manson El. Lt. & Pwr. Co., it is reported, contemplates the installation of new machinery in its plant. H. R. Healey is manager.

MOUNT PLEASANT, IA.—The City Council is contemplating the installation of an ornamental street-lighting system on the public square and on North Jefferson and North Main Streets.

OELWEIN, IA.—The Oelwein Lt., Ht. & Pwr. Co. is reported to have engaged George H. Rowe, of the Utility Development Co., of Chicago, Ill., to take charge of rebuilding its plant recently burned down. The company, it is understood, will install one 250-kw and two 150-kw generating units and erect a smokestack 140 ft. high.

REASNOR, IA.—The installation of an electric-light plant at Reasnor is under consideration. J. B. Van Baren is reported interested in the project.

ROCKWELL CITY, IA.—The property of the Calhoun County Pub. Ser. Co., of Rockwell City, is reported to have been purchased by the Central Iowa Lt. & Pwr. Co. This includes the franchise at Churdan and Lohrville.

SERGEANT BLUFFS, IA.—Bids will be received until Oct. 17 by the village of Sergeant Bluffs for an engine, generator, storage battery and switchboard; also for erection of power house and pole line. Plans are on file in the office of the clerk of the Village Board, and at the office of the engineer of the Ryan El. Co., 312 Pierce Street, Sioux City.

TROY MILLS, IA.—A company has been organized with a capital stock of $40,000 to develop the water-power of the Wapsiepennican River and install an electric generating plant to furnish electricity in Troy Mills and surrounding towns. W. R. Furman is president, W. F. Stauffer secretary and treasurer, and G. F. Furman general manager.

CARROLLTON, MO.—The Wtr., Lt. & Transit Co., it is reported, is contemplating the installation of a 300-hp water-tube boiler.

JOPLIN, MO.—The city of Joplin, it is reported, will soon call for bids for installing lamps on the Broadway Viaduct.

KING CITY, MO.—Within the next six months the King City El. & Mfg. Co. expects to purchase material for ten additional street lamps. By next spring the company will probably establish a 24-hour service. Harry V. Forest is secretary and manager.

SMITHVILLE, MO.—At an election held Sept. 29 the proposal to install a municipal electric-lighting system in Smithville was carried.

SPRINGFIELD, MO.—Plans for extensions to the present ornamental street-lighting system on Commercial Street are under consideration by the Commercial Club.

HECLA, S. D.—The town of Hecla is installing a municipal electric-light plant. Contract has been placed with the Murray Iron Works, of Burlington, Ia., for engine and boiler for same.

FALLS CITY, NEB.—The city of Falls City expects to purchase within the next three months 1500 ft. of three-wire cable, 5000 ft. of two-wire cable and 40 ornamental lamp standards. G. E. Johnson is city engineer.

MADISON, NEB.—The power station of the municipal electric-light plant has re-

cently been enlarged and a Bates Corliss engine installed. A. E. Kernick is general manager.

NORFOLK, NEB.—The Norfolk El. Lt. & Pwr. Co. has submitted a proposal to the City Council offering to install a new street-lighting system in the business and residential districts, to cost about $10,000. W. C. Boss is general manager.

HOISINGTON, KAN.—Within the next two months the Hoisington El. & Ice Co. expects to purchase material for an ornamental lighting system (three blocks), including lamp standards, glassware, conduit, cable, etc.; also within the next three months some electric ranges, washing machines and vacuum cleaners. J. R. Murphy is manager.

KANSAS CITY, KAN.—Bids, it is reported, will soon be called for by L. H. Chapman, commissioner of water and light department, for equipment for the municipal electric-light plant, including a 3500-kw turbo-generator set with condenser equipment, switchboard, etc.

Southern States

MULLINS, S. C.—Bids will be received by the Board of Public Works until Oct. 29 for the construction of water-works and sewerage system. The work will include an electrically operated and gasoline-engine-driven pumping station, reservoir, tower and tank, about 5 miles of watermains and 6 miles of sewerage. Gilbert C. White, of Charlotte, is engineer.

WESTMINSTER, S. C.—At an election held recently the proposal to issue $10,000 in bonds for the installation of a municipal electric-light plant was carried.

ATLANTA, GA.—At a cost of approximately $60,000, the Georgia Ry. & Pwr. Co. has agreed to install a system of cable over its various routes to lessen the damage to the city water mains, conduit and fire-alarm cables. P. S. Arkwright is president of the company.

BULLOCHVILLE, GA.—Application has been made for a charter for the Bullochville El. Ltg. Co. with a capital stock of $1,000, with privilege of increasing it to $50,000, for the purpose of generating electricity for lighting purpose and also to deal in electric fixtures. W. B. Butts and E. A. Williams are reported interested in the company.

HELENA, GA.—At an election to be held Oct. 17 the proposal to issue $13,000 in bonds to construct a municipal electric-light plant will be submitted to the voters.

LEESBURG, GA.—Plans are being prepared, it is reported, by the J. B. McCrary Co., of Atlanta, for the installation of an electric-light plant in Leesburg, to cost about $30,000.

APOKA, FLA.—The Town Council has granted M. T. Anderson a franchise to construct and operate an electric-light plant and water-works system in Apoka.

MELBOURNE, FLA.—The contract for the installation of a municipal electric-light plant is reported to have been awarded to the J. B. McCrary Co., of Atlanta, Ga.

MERIDIAN, MISS.—The commissioners of the Tuberculosis Hospital have awarded the contract for the installation of an electric light and power plant in the hospital to the Dalton El. Co., of Meridian.

GRANDFIELD, OKLA. — Arrangements have been made by J. S. Green, manager of the Grandfield & Devol. Tel. Co., and O. E. Mapel for rebuilding the electric-light plant, which was destroyed by fire last spring. Machinery for the plant, it is understood, has been purchased.

BROWNSVILLE, TEX.—Plans are being considered by James A. Browne, owner of the local street-railway system (operated by gasoline engines), for the construction of an electric power plant and to equip the street-railway system for electrical operation. The Rio Grande Railroad, which runs from Brownsville to Point Isabel, a distance of 22 miles (which is also owned by Mr. Browne), it is reported, will be rebuilt and will connect with the city system.

MAGNOLIA PARK, TEX.—The portion of the Harrisburg road passing through Magnolia Park will be lighted with 33 electric lamps. The Magnolia Park Land Co. will pay for the fixtures and maintenance of the lamps for one year. Magnolia Park has not a post office.

Pacific States

SEATTLE, WASH.—The City Council has passed an ordinance granting the Lighting Department an appropriation of $40,000, which will be used for the purchase of cables for underground construction preparatory to the removal of poles on Yesler Way and water-front districts. An additional boiler will be installed in the Lake Union plant.

SEATTLE, WASH.—It is reported that an effort is being made to establish two electric-light and power plants in China and that the project is being promoted by parties familiar with American electrical machinery. Orders, it is understood, will be placed in the near future for boilers, electrical equipment, etc. For further information address W. H. Henderson, Bureau of Foreign and Domestic Commerce, Alaska Building, Seattle, Wash.

TACOMA, WASH. — Property owners along D Street from the intersection of St. Helen's Avenue and Jefferson Avenue have petitioned the City Council for the installation of street lamps. The Council has authorized the city engineer to prepare an estimate of cost of same.

TACOMA, WASH.—Investigations have been made by Mayor Fawcett and the City Council of the power site on the White River above Buckley, owned by P. H. Webb, which has been offered to the city for $1,000,000. B. W. Collins, city superintendent of electrical works, has recently recommended that something be done at once to provide storage for surplus water at the Nisqually plant for at least 40 days in the year, and further, that steps be taken to acquire a greater horse-power maximum for future new business.

BAKER CITY, ORE.—The Dry Ditch & El. Pwr. Co., successor to the Dry Ditch Co., of Baker, is reported to be contemplating the construction of a hydroelectric plant on Eagle Creek, where a fall of 300 ft. can be obtained.

THE DALLES, ORE.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 12 for construction complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at The Dalles. Drawings and specifications may be obtained from the above office and from the custodian of site at The Dalles. O. Wenderoth is supervising architect.

FRESNO, CAL.—Specifications, it is reported, have been adopted for an electrolier lighting system which provide for cast-iron and copper standards, instead of cast-iron, steel and copper as in the previous specifications.

LOMPOC, CAL.—A new transmission line is being erected by the Midland Counties Pub. Ser. Corpn., from Santa Maria to Lompoc, a distance of 12 miles. The line when completed will furnish energy to the Lompoc Lt. & Pwr. Co. for general distribution. The chief object of the extension, it is said, is to supply electricity to the Kiselguhr Co. for operating its mining and manufacturing works.

SAN FRANCISCO, CAL.—The Board of Supervisors has passed an ordinance providing for the installation of an electric conduit system throughout the civic center.

SAN FRANCISCO, CAL.—The report of the city engineer submitted to the Board of Supervisors estimates the cost of the construction of the 28 municipal street-railway lines for which applications have been filed at $9,000,000. The total length is approximately 89 miles.

VISALIA, CAL.—The substation of the Mount Whitney Pwr. & El. Co. at Tipton was recently destroyed by fire.

CŒUR D'ALENE, IDAHO.—A petition has been filed with the city clerk by property owners on Fourth Street for additional street lamps and a change in the present lamps from 40 watts to 60 watts. The property owners on Riverside and Smilie Avenues have also asked for the installation of electric lamps.

MANTUA, UTAH.—Preparations are being made by the town of Mantua to install an electric-lighting system, to cost about $3,000. Electricity for maintaining same will be purchased from the municipal electric-light plant in Brigham City.

MOAB, UTAH.—Arrangements are being made by J. W. Christensen, of Fairview, and C. A. Hammond, of Moab, for the installation of an electric-light plant in Moab, for which a franchise was recently granted. Contracts for equipment of plant and distributing system have been placed with the Inter-Mountain El. Co., of Salt Lake City. It is also proposed to erect a flour mill and ice plant in connection with the power plant.

TOOELE, UTAH.—The Clark El. Pwr. Co., of Tooele, expects to reconstruct 2 miles of 6000-volt distribution line and to purchase considerable meter equipment for three plants within the next three months. Within the next 12 months the company plans to develop a demand for electrical appliances. C. S. Anderson is superintendent.

THERMOPOLIS, WYO.—Within the next eight months the Hot Springs Lt. & Pwr. Co., of Thermopolis, expects to erect 50 miles of telephone lines; also to purchase within the next 12 months one 100-kw, three-phase, 60-cycle, 2300-volt steam turbine and to purchase material for distribution and lighting systems to meet regular requirements. The company uses about $1,000 worth of electrical supplies and appliances per year. M. W. Thompson is manager.

SILVER CITY, N. M.—The Empire Zinc Pwr. Co. is reported to be considering the construction of a tramway from its Cleveland group of mines in the Pinos Altos district to Silver City, a distance of 10 miles. The proposed road will be operated by mules, pending the construction of an electric power plant.

Canada

EDMONTON, ALTA.—The Wabamun Pwr. & Coal Co. is reported to have submitted a proposal to the City Council offering to supply electrical energy to the city, to be delivered at any point within the city limits at 1 cent per kw-hr.

EDMONTON, ALTA.—The Electric Light Department has recently completed the installation of an ornamental lighting system in both the North and South Side business sections of the city, also the illumination of the traffic dock on the new high-level bridge which spans the Saskatchewan River, connecting the North and South Sides of the city. Other improvements have been planned to the street-lighting system for this year, but are held pending the adjustment of financial conditions.

MEDICINE HAT, ALTA.—Within the next 30 days the city of Medicine Hat expects to install one 1500-kw Westinghouse turbo-generator (three-phase, 69 cycles, 2300 volts), also one 325-hp turbine (Westinghouse), connected to centrifugal pump, having a capacity of 3,000,000 gal. per day. G. R. Taylor is city electrical engineer.

REVELSTOKE, B. C.—The Electric Light Department expects to install within the next six months one 1400-hp hydraulic turbine and one 750-kva generator and accessories. C. North is superintendent.

ST. CATHARINES, ONT.—The City Council has decided to replace many of the gas lamps now in use with 80-cp incandescent electric lamps.

TORONTO, ONT.—Tenders will be received by the city of Toronto until Oct. 13 for supplies for the Fire Department, including copper-clad wire, new circuit wheels for fire-alarm boxes, etc. Plans and specifications may be obtained from the Fire Department, Adelaide Street Fire Hall, Toronto.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer, Panama Canal, Washington, D. C., until Oct. 16 for furnishing material for underground cable work at Ancon, Balboa and Gatun, bracing rods, angle and sheet steel, soft steel, checkered steel plates, natural black slate, paint mills and paint mixers. For further information address Major F. C. Boggs, purchasing agent.

New Incorporations

DOVER, DEL.—The Tunky Trans. & Pwr. Co. has been chartered under the laws of the State of Delaware to operate power plants and railroad in Nicaragua, C. A. The company is capitalized at $50,000. The incorporators are: Joseph A. Austin, of Ardmore, Pa.; Clinton A. Higbee, of Philadelphia, Pa., and J. Harry Whiteman, of Wilmington, Del.

EMDEN, ILL.—The Emden Lt. & Pwr. Co. has been incorporated with a capital stock of $2,400 by Cyrus J. McCormick, R. L. McCormick, H. W. Alberts, T. U. Rademaker, J. H. Butler and B. M. Barringer. The company proposes to generate and distribute electricity and also to operate water-works system.

BANGOR, MAINE.—The Waldo-Penobscot Lt. & Pwr. Co. has been incorporated with a capital stock of $300,000 for the purpose of generating and distributing electricity for lamps, heaters and motors. The officers are Nelson H. Hydorn, president, and T. B. Towle, treasurer, both of Bangor.

EDGERTON, MO.—The McCosmas Hydro-Electric Lt. Co. has been incorporated by Joseph M. McCosmas, George W. Johnson, William T. Mauzey, John T. Jackson and others. The company is capitalized at $50,000 and proposes to construct a dam across Platte River, near Edgerton, and erect a power plant to supply electricity in nearby towns.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED SEPT. 29, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,111,733. TRANSMITTING APPARATUS FOR USE IN ELECTRIC SIGNALING ON RAILWAYS; G. H. Brown (deceased), Belfast, Ireland. App. filed Aug. 31, 1909. For intercommunication between a signalman and train officials.

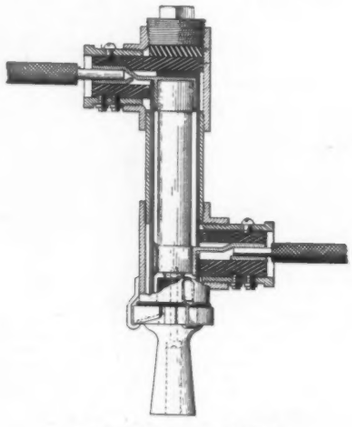
1,111,742. AUTOMATIC TOLL RECORDER FOR TELEPHONE SYSTEMS; E. G. Godfree, Melbourne, Victoria, Australia. App. filed March 18, 1912. Consequent pole electromagnet closes registering circuit only when calling and answering subscribers are in communication.

1,111,748. SPEED-CONTROLLING DEVICE; K. L. Harter and H. T. Reynolds, Tampa, Fla. App. filed July 24, 1913. Short-circuits ignition circuit of automobile upon predetermined speed being reached.

1,111,782. CONNECTOR; W. C. Banks, New York, N. Y. App. filed July 29, 1913. Clamps for taking current from third-rail.

1,111,783. GROUND CONNECTION; W. C. Banks, New York, N. Y. App. filed Sept. 5, 1912. Perforated receptacles of gradually increasing size containing charcoal.

1,111,789. THERMAL RELAY; T. B. Freas, East Orange, N. J. App. filed Dec. 4, 1911. Provides certainty of operation of the main switch.



1,112,156—Fuse Switch

1,111,790. ELECTRIC HEATER; W. H. Fulton, New York, N. Y. App. filed Aug. 26, 1908. Car heater which can be readily assembled and disassembled.

1,111,792. SELECTIVE SIGNALING SYSTEM; E. R. Gill, Yonkers, N. Y. App. filed March 28, 1910. For train-dispatching work; telephone and telegraph apparatus can be simultaneously operated.

1,111,798. ELECTRIC SWITCH; C. J. Klein, Milwaukee, Wis. App. filed Oct. 5, 1911. Push-button lamp socket.

1,111,851. SIGNALING SYSTEM FOR HIGH-VOLTAGE RAILWAYS; C. P. Nachod, Philadelphia, Pa. App. filed July 23, 1912. Uses lower voltage than that used for propulsion.

1,111,864. ELECTRIC-LIGHTING APPARATUS FOR VELOCIPEDES; A. Sanladerer, Vilhoffen, Germany. App. filed June 12, 1913. Dynamo placed within the hub of the velocipede wheel.

1,111,866. PULSATION-PRODUCING DEVICE FOR ELECTRICAL MUSICAL INSTRUMENTS; M. L. Severy, Arlington Heights, Mass., and G. B. Sinclair, Boston, Mass. App. filed July 25, 1907. Has rotative pulsation-producing members.

1,111,876. TELEPHONE SYSTEM; C. S. Winston, Chicago, Ill. App. filed Nov. 1, 1912. Interconnecting magneto line.

1,111,898. ELECTRODE FOR ELECTROLYTIC MEASURING INSTRUMENTS; H. S. Hatfield, Brunswick, Germany. App. filed June 28, 1913. Electrolyte chamber has a gas space in the side thereof.

1,111,912. THERMOMETRIC FIRE DETECTOR; K. Matsudaira, Washington, D. C. App. filed May 1, 1912. Thermometer tube with wires inserted in the ends thereof.

1,111,930. RAILWAY-SIGNAL AND SWITCH-OPERATING MEANS; P. G. Ten Eyck, Albany, N. Y. App. filed Aug. 24, 1909. Tower control system.

1,111,956. ELECTRIC LAMP; T. P. Driver, Melrose, Mass. App. filed May 15, 1914. Adapted to be clamped to terminals of ordinary dry cell.

1,111,963. SPARK-GAP; G. F. Knorr, Des Moines, Ia. App. filed Oct. 6, 1913. Adapted for attachment direct to a spark plug.

1,111,977. ELECTROLYTIC CELL; C. C. Titus, Helena, Mont. App. filed Dec. 14, 1910. For production of chlorine and caustic soda.

1,112,022. CONCATENATED CONTROL OF ALTERNATING-CURRENT MOTORS; R. D. Mershon, New York, N. Y. App. filed June 11, 1906. Condensers connected across the connections of two motors of the concatenated system.

1,112,028. TROLLEY-POLE HEAD; J. Paradowish, Brockton, Mass. App. filed June 5, 1914. Pivoted jaws slidingly engage the wire.

1,112,047. CIRCUIT-WIRE TERMINAL; A. A. Ziegler, Boston, Mass. App. filed Aug. 11, 1913. Made of sheet metal doubled over upon itself.

1,112,087. METHOD OF HARDENING AND TEMPERING; J. Patten, Baltimore, Md. App. filed Aug. 15, 1912. For gun barrels and engine cylinders; traverses surface with an electric arc and immediately cools.

1,112,140. TELEPHONE SYSTEM; D. S. Hulfish, Toronto, Ontario, Canada. App. filed Nov. 26, 1910. Uses a call-answering plug, a ringing plug and a ringing key with special contacts.

1,112,143. LOCKING DEVICE FOR ELECTRICALLY OPERATED PIANOS; J. F. Kelly, Pittsfield, Mass. App. filed May 31, 1912. Key-locking device.

1,112,156. FUSE SWITCH; T. E. Murray, New York, N. Y. App. filed Nov. 28, 1913. Cartridge fuse with insulating handle by which it can be inserted into its casing.

1,112,161. SNAP SWITCH; C. Roth, Brooklyn, N. Y. App. filed Oct. 28, 1913. Has special detent mechanism.

1,112,165. FLUID RHEOSTAT; A. Simon, Milwaukee, Wis. App. filed March 10, 1913. Circulates the fluid through the rheostat tank.

1,112,167. TELEPHONE TRANSMITTER; J. L. Spence, New York, N. Y. App. filed June 6, 1913. Resilient mounting for the diaphragm.

1,112,169. RHEOSTAT; L. L. Tatum, Milwaukee, Wis. App. filed Dec. 7, 1908. Grid resistance with raised contact surfaces engaged by a switch lever.

1,112,170. RHEOSTAT; L. L. Tatum, Milwaukee, Wis. App. filed Feb. 10, 1913. Theater dimmer.

1,112,177. ELECTRICAL SYSTEM; R. Varley, Englewood, N. J. App. filed March 21, 1914. Produces a prolonged bridging of the spark-gap, for ignition.

1,112,191. CARBON BRUSH AND PIGTAIL; W. L. Bliss, Milwaukee, Wis. App. filed May 2, 1910. Conducting member is riveted to brush and screws maintain contact with the rivets.

1,112,196. ELECTRIC REGULATION; J. L. Creveling, New York, N. Y. App. filed Nov. 5, 1910. Car-lighting system.

1,112,208. COMBINED CIGAR LIGHTER AND CUTTER; L. B. Grasberger, Richmond, Va. App. filed June 22, 1912. Cutter and lighter operate simultaneously.

1,112,265. CURRENT-RECTIFYING APPARATUS; F. Conrad, Swissvale, Pa. App. filed Jan. 10, 1912. Prevents short-circuits in a vapor-like rectifier.

1,112,266. RECTIFIER SYSTEM; F. Conrad, Swissvale, Pa. App. filed June 21, 1912. Limits short-circuits to a harmless value.

1,112,278. AUTOMOBILE SIGNAL; R. G. Falconer, Washington, D. C. App. filed Sept. 14, 1912. Gear shift and steering gear automatically set the rear signals.

1,112,281. COOKING UTENSIL; M. J. Flynn, Portsmouth, Va. App. filed March 7, 1914. For use on shipboard.

1,112,282. RECTIFIER SYSTEM; C. Le G. Fortescue, Pittsburgh, Pa. App. filed June 21, 1912. For preventing short-circuiting in vapor apparatus.

1,112,283. SYSTEM OF ELECTRICAL DISTRIBUTION; J. J. Frank, Pittsfield, Mass. App. filed Sept. 5, 1912. Vapor rectifier in unitary structure.

1,112,291. SANITARY MOUTHPIECE; E. M. Jenkins, Italy, Tex. App. filed March 7, 1913. For telephones.

1,112,310. AUTOMATIC ELECTRICAL ANNOUNCER; A. J. W. Munden and J. M. Muir, Dunedin, New Zealand. App. filed June 19, 1912. Route-indicating apparatus.

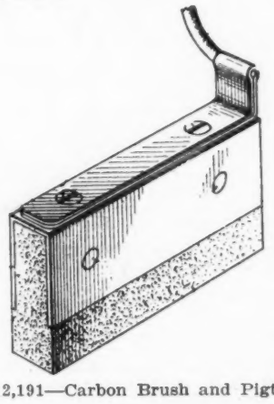
1,112,313. FUSE CAPSULE; H. T. Palste, Philadelphia, Pa. App. filed June 5, 1913. Prevents discoloration of the mica cover.

1,112,316. ALARM LOCK; L. Percival, Tacoma, Wash. App. filed May 8, 1909. Sounds alarm when attempt is made to open lock.

1,112,346. MAIL BOX; J. F. Wilcox, Earlsboro, Okla. App. filed April 13, 1912. Rural service; signals to the house the presence of mail in the box.

1,112,361. ARC-LIGHT ELECTRODE; C. W. Dake, Chicago, Ill. App. filed Dec. 5, 1912. Has longitudinal, notched cooling ribs.

1,112,365. ELECTROMECHANICAL WARP STOP MOTION; G. J. Dustin, Plymouth, Mass. App. filed Dec. 23, 1911. Harness frame has terminals which can be engaged by the heddles only when they are in abnormal position.



1,112,191—Carbon Brush and Pigtail

1,112,378. SWITCHING APPARATUS; H. F. Newbury, New York, N. Y. App. filed Jan. 28, 1905. For signals of elevator system.

1,112,379. ELEVATOR SIGNAL SYSTEM OR APPARATUS; H. F. Newbury, New York, N. Y. App. filed Oct. 14, 1911. Indicates to intending passenger the cars approaching in the right direction.

1,112,385. SIGNAL SYSTEM; J. J. Ruddick, West Newton, Mass. App. filed Oct. 9, 1911. For railways; rails have insulated sections.

1,112,391. THERMOSTATIC CIRCUIT-CONTROLLER; G. E. Spear, Amesbury, Mass. App. filed April 11, 1913. To give alarm in greenhouses.

1,112,392. TELEPHONE RECEIVER; J. L. Spence, New York, N. Y. App. filed June 6, 1913. Yielding mounting for a relatively inflexible diaphragm.

1,112,397. CONDENSER; P. Thomas, Wilkinsburg, Pa. App. filed Dec. 4, 1913. Dielectric of fibrous material impregnated with chlorinated stearic acid.

1,112,411. WAVE DETECTOR; R. T. Ackley, Cortland, Ohio. App. filed Dec. 17, 1912. Loosely engaging disks acted on by magnets.

1,112,415. LINE CONNECTOR; D. W. Kneisly, Dayton, Ohio. App. filed Jan. 5, 1912. For telephone work.

1,112,426. WALL BOX; H. A. Stoddard, Philadelphia, Pa. App. filed Dec. 4, 1912. Sectional and extensible construction.